Inter-Domain Routing Working Group
Internet Draft

J. Haas
NextHop
S. Hares
NextHop
W. Tackabury
Gold Wire Technology

February 28, 2002

Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4), Second Version

<draft-ietf-idr-bgp4-mibv2-02.txt>

Status of this Memo

Copyright Notice

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, this MIB defines objects that facilitate the

management of the Border Gateway Protocol Version 4 (BGP4).

Distribution of this memo is unlimited.

1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing the Border Gateway Protocol Version 4.

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [1].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in STD 58, RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [18].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

2. Objectives

This MIB Module is meant to broadly update and replace a prior MIB Module defined in RFC 1657 [12]. Additionally, there is another effort underway to address very specific limited objectives in updating points in the RFC 1657 object definition and managed object attributes [13]. The MIB Module described herein is intended to fully serve the functions and scope of RFC 1657 and these RFC 1657 updates.

2.1. Protocol Extensions

Additionally, however, there are a number of ways in which the BGP Protocol has been enhanced through its ability for added capabilities. Implementations of those capabilities have not been able to have any management capabilities present in RFC 1657-compliant MIB module agents, since the capabilities themselves postdated the adoption of RFC 1657. For several significant capabilities, in the form of BGP Communities [17], Autonomous System Confederation [16] , BGP Multiprotocol Extensions [18], and Route Reflection [19], the MIB Module defined in this document exposes object types to manage those extended capabilities and their operation.

One of these extensions in particular (the multiprotocol extensions) requires a thorough redefinition of MIB table row indices from the RFC 1657 state. This allows transport-independent address indices consistent with the Address Family Identifier (AFI) and Subsequent Address Family Identifier (SAFI) mechanisms of that extension.

2.2. Mechanisms for MIB Extensibility

Moreover, the requirement for the incremental update of support for capabilities such as these begs the issue of placing modular extensibility for protocol extensions within the framework of the MIB itself. Going forward, it would be very desirable to have attributes of the MIB structure, and administrative procedures, to allow the incremental update of the MIB scope to cover any such new protocol extensions, without requiring a reissue of the entire MIB. In this sense, we seek to structure the MIB much like the underlying BGP4 itself, allowing capability-by-capability update.

2.3. BGP Configuration

Finally, the definition and adoption of Version 3 of the SNMP has occurred since the adoption of the RFC 1657 MIB. As a result, the ability to deploy secure configuration of managed elements via SNMP in a standardized way has become a reality for managed networks. In this MIB definition effort, we seek to expose a more thorough capacity for configuration of BGP4 and its capabilities than was present in RFC 1657 or than was common practice at the time of its adoption.

3. MIB Organization

The MIB is broken down into several top level sections. This sectionalization is important to create an organization for extensibility.

In general, a top level section of the MIB module will identify some number of "core" scalar and tabular objects rooted off of it. If there is sufficient depth within a subsection of one of these top-level sections, the "core" subdivision off of the top level section may provide multiple levels to the OBJECT IDENTIFIER scope necessary to define its management data.

Once this core section is defined, however, each top-level section has an explicit provision for an 'extensions' section OBJECT IDENTIFIER. The intent of the extensions section is to be containment for discrete per-extension sections. By 'extension' here, we refer to protocol mechanisms, capabilities, and exchanges which are not defined in the base Border Gateway Protocol definition, or is not configuration for protocol operations of similarly 'core' status. Currently, we propose keying the identification within the per-extension section in one of two ways.

Where the extension is keyed to a defined capability which has an associated BGP capability number assigned by IANA (for example, multiprotocol BGP extensions), the per extension section will be that defined IANA capability number. Where the extension has management information suitable for a MIB extension but does not correspond to an exchanged protocol capability (for example, BGP Route Reflection), the extension section shall have its final OBJECT IDENTIFIER fragment correspond to the RFC number which first uniquely defined the extension (i.e., not requiring renumbering at the time a defining RFC for a protocol mechanism is outdated by a later RFC).

3.1. bgpM2BaseScalars

The bgpM2BaseScalars section (and corresponding OBJECT IDENTIFIER) is used to delineate object types used for basic management and monitoring of the protocol implementation. These are core parameters for the local configuration. While notifications are designed to be extensible into any other section in the MIB module, the currently defined traps are located here, in a subsection 'bgpM2BaseNotifications'. This is rooted at index level zero (0) here, owing to conventions established in [4].

Support for multiple concurrently supported versions of BGP is exposed through the entries of the bgpM2VersionTable. Similarly, support for multiple capabilities and authentication mechanisms, as identified by their assigned numbers, are reported in the bgpM2SupportedCapabilitiesTable and bgpM2SupportedAuthTable respectively.

In the MIB document, there are currently scalar extension mechanisms to allow the agent to report membership of a local BGP Confederation [21] or Route Reflection Cluster ID [24], as well as whether these capabilities are in fact supported by the implementation. These are consistent with the non-capability based extension section indexing guidelines as presented above.

bgpM2BaseScalars also is the root for a subsection, bgpM2BaseScalarConfiguration, which contains the companion configuration objects for the base scalar objects delineated in the preceding paragraphs. These are presented as a series of scalar read-write objects, with a single OBJECT-TYPE of syntax StorageType to designate the persistence of the instance value data for these configuration scalars.

3.2. bgpM2PeerData

The bgpM2PeerData section is per-peer object type definitions. The predominant table of read-only STATUS object types in that section (bgpM2PeerTable) describes the session, negotiation state, and authentication state on a per peer basis. A second table (bgpM2PrefixCountersTable) exposes information about individual route prefixes received over each peer session. A separate subsection and its subordinate table (bgpM2PeerErrorsTable) reports information about the last error encountered on a given peering session.

Further subsections report authentication state with the peer, peering session detected errors, and elapsed time it has taken to advance the peering session into various states defined in the protocol FSM.

The bgpM2PeerConfiguredTimersTable reports and allows dynamic reset of key timers on the peer session. These currently allow reset of hold time and keepalive timer, for compatibility with the same capabilities in RFC 1657 [17]. For these resettable timers, their end-to-end negotiated current values are reflected in the bgpM2PeerNegotiatedTimersTable.

As currently defined, these tables describing authentication, error state, and timer values (in addition to the configuration tables for session timers) are tightly coupled enough to the logical per-row view exposed in the bgpM2PeerTable row entries on a session that these subordinate "tables" are defined as AUGMENTing the bgpM2PeerTable itself. The other primary design criterion behind this decision is that using this AUGMENTation does not increase the per-row-data requirements of bgpM2PeerTable instance retrieval so as to make such per-row retrieval unwieldy for the management application.

3.2.1. bgpM2PeerCapabilities

bgpM2PeerCapabilitiesData has objects and tables to describe BGP capabilities locally supported, and those reported and negotiated over each peer session. For tables supporting each of these capability sets, capability code and data value are provided. Attention must be given to the fact that multiple instances of a given capability can be transmitted between BGP speakers.

3.2.2. bgpM2PeerCounters

The bgpM2CountersTable and bgpM2PrefixCountersTable report protocol exchanges/FSM transitions, and discrete number of NLRIs exchanged per peering session, respectively. This is independent of actual exchanged path attributes, which are tabularized later in the MIB module. Note that session transitions as reflected in changes of instances within this table may also be reflected in issuance of bgpM2Established and bgpM2BackwardTransition NOTIFICATION-TYPE PDUs.

3.2.3. Peering Data Extensions

Route reflector status on a per-peer basis (whether the peer is a client or nonClient of the local BGP router's reflected route propagation), and peer confederation membership is reported in non capability extensions of the peering data section.

3.2.4. Configuring Peering Sessions

The MIB has several tables indexed on a per-peer level of granularity to control creation and activation of new peering sessions, and to allow control on running sessions (those reflected in bgpM2PeerTable row instances) regardless of what caused their creation in the BGP routing process.

The bgpM2CfgPeerAdminStatusTable allows creation and specification of a row by a bgpM2PeerIndex value (which is how its associated row instance is identified in the bgpM2PeerTable). For each such row instance, the set of the bgpM2CfgPeerAdminStatus OBJECT-TYPE of MAX-ACCESS read-write can allow management application start and stop of the session.

This is contrasted with the function of the bgpM2CfgPeerTable, and its related AUGMENTed tables bgpM2CfgPeerTimersTable and bgpM2Cfg-PeerAuthTable. These are used to facilitate direct creation of peering sessions by the management application. The function of columnar OBJECT-TYPEs within the bgpM2CfgPeerTable for local and remote address, version negotiation, and various row-administrative attributes (RowStatus and StorageType SYNTAXes) are straightforward enough. The only subtlety with respect to how peering sessions are activated from usage of this table, and how the activated sessions are reflected through their bgpM2PeerTable and bgpM2CfgPeerAdminStatusTable entries, is in the usage of the bgpM2CfgPeerTable columnar object bgpM2CfgPeerStatus. bgpM2CfgPeerStatus can take on two values. When a peering session, as reflected through its row instance in the bgpM2CfgPeerTable, has the bgpM2CfgPeerStatus instance value in that row set to running(2) at the time of the SYNTAX RowStatus object instance of bgpM2CfgPeerRowEntryStatus set to active(1), the peering session will in fact be activated in the BGP routing process (in addition to having its row instance created in the bgpM2Cfg-PeerTable and bgpM2CfgPeerAdminStatusTable). In this case, the associated row of the bgpM2CfgPeerAdminStatusTable row bgpM2CfgPeerAdmin-Status instance would have the value of start(2). If, in the prior example, the bgpM2CfgPeerStatus is halted(1) at the time of the bgpM2CfgPeerRowEntryStatus instance set to active(1), only the peering table entries would be created at this time of activation, without the peering session being automatically started. The bgpM2Cfg-PeerAdminStatusTable row bgpM2CfgPeerAdminStatus instance associated with the session would in this case reflect a value of stop(1).

Since the row entries of the per-peer configuration tables which AUGMENT the bgpM2CfgPeerTable logically fate-share the row instances in the bgpM2CfgPeerTable which they are AUGMENTing, they also share the same StorageType and RowStatus SYNTAX object sense of the

bgpM2CfgPeerTable rows which they augment.

3.3. BGP Routing Information Base Data

An important table for providing index information for other tables in the MIB module is the bgpM2NlriTable. This discriminates on a given network prefix (by AFI/SAFI), and the peer which advertised the prefix (since it can be heard of from multiple speakers). The bgpM2PathAttrIndex column which identifies each row in this table is used as an index for other per-attribute tables through the remainder of the MIB module.

RFC 3107 [26] specifies a capability for exchanged routes between BGP peers to attach attribute information to a route indicating, specifically, related MPLS label path information. The MIB supports the presentation of this attribute information by generalizing how these attributes are presented to accommodate further extensions of this particular type. Within a given bgpM2NlriTable entry, we speak of attribute data of this type as being 'opaque' to BGP, and use the columnar OBJECT-TYPEs bgpM2NlriOpaqueType and bgpM2NlriOpaquePointer to refer to it. In the case of the RFC 3107 MPLS label encoding (which is the only usage of these columnar fields in the bgpM2NlriTable right now), a MPLS label stack would be referenced by bgpM2NlriOpaquePointer by its per-NLRI instance pointing to a row instance in the MPLS LSR MIB mplsLabelStackTable, and the bgpM2NlriOpaqueType instance having a value of bgpMplsLabelStack(1).

The bgpM2AdjRibsOutTable row entries reflect data on routes which have been placed, per peering session, in the Adj-Rib-Out for advertisement to the associated peer.

The bgpM2PathAttrTable provides discrete BGP NLRI attributes which were received with the advertisement of the prefix by its advertising peer. Specific information about the autonomous system path (AS Path) advertised with the NLRI, on a per AS value, is to be found in the bgpM2AsPathTable.

Finally, where attributes which were unable to be reported in the bgpM2PathAttrTable, the AS Path table, or any defined per-NLRI tables in the agent were received with the prefix, those attributes are reported via the bgpM2PathAttrUnknownTable. Short of advertised attribute type, no semantic breakdown of the unknown attribute data is provided. That data is only available as a raw OCTET STRING in the bgpM2PathAttrUnknownValue column of this table.

3.3.1. Routing Information Base Extensions

There are two extension sections and five subordinate tables to the bgpM2PathAttrTable and RIB data OBJECT IDENTIFIER-delimited MIB module section. The bgpM2PathAttrRouteReflectionExts and its contained bgpM2PathAttrOriginatorIdTable report on the originating route reflector. The bgpM2PathAttrClusterTable specifically reports on the reflection route a NLRI has traversed to get to the local BGP routing process.

The bgpM2PathAttrCommunityExts section deals with extended and non-extended communities for network routes. The bgpM2PathAttrCommTable bgpM2PathAttrExtCommTable contained herein report community membership (if any) on a per network-prefix basis.

3.4. Consideration On Table Indexing

There are certain efficiency concerns for row index management for management applications which are useful to take into consideration, given the nature of some of the tables implied in the preceding section.

In the first place, it is valuable to exploit the direct relationship of entries in, for example, the bgpM2PrefixCountersTable as they relate to the entry in the bgpM2PeerTable to which they are related. More compelling is the example case of the one-to-many relationship between a row entry in the bgpM2PeerTable and the bgpM2PathAttrTable, the latter of which maintains per-row entries for potentially many NLRIs as received from a peer in a BGP UPDATE message. From the point of view of normalizing these relationships, it would be useful to have a direct reference to the "governing" bgpM2PeerTable row entry for the peer which is a "dependency" for the subordinate table row entry for other peer data.

Second, the nature of protocol-independent addressing makes the indexing of these entries indirectly even more compelling. Even accounting for the addressing requirements of IPv6 and the provision of AFI and SAFI qualifiers, the logical addressing of a row in the bgpPathAttrClusterTable (for example) would extend out some 50 bytes if there was no direct index linkage to the "governing" bgpPathAttrTable, and bgpPeerTable entries.

For this reason, the tables are structured in such a way that, where there is such a linkage to a "dependent" table (where, for example, the bgpPrefixCountersTable "depends on" the bgpPeerTable), a table will contain a per-row numeric index (e.g., bgpPeerIndex), which the "dependent" table will use as one of its own row index values. These indices are manufactured by the agent, and are otherwise opaque to

the management application (or, for that matter, even to the organization of the "dependent" table[s]).

Where considerations of per-row retrieval overhead (in terms of typical row instance data size, as a function of liability to have a single row retrieval exceed PDU size, for example), and those of general logical data organization permit, certain tables logically at the sub-peering-session level have been specified as AUGMENTing the primary tables (bgpM2PeerTable and bgpM2CfgPeerTable) to which those sub-peering-session row entries relate. This is to facilitate ease on the part of a management application of assembling (for example, via GET-BULK operations across a lexicographically contiguous row scope) a management image of control information on a given peering session.

1.

```
BGP4-V2-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
        Counter32, Gauge32, mib-2, Unsigned32, Integer32
            FROM SNMPv2-SMI
        -- Note that the following reference to INET-ADDRESS-MIB
        -- refers to the version as published in the RFC 2851
        -- update internet draft.
       InetAddressType, InetAddress, InetPortNumber,
        InetAutonomousSystemNumber, InetAddressPrefixLength
            FROM INET-ADDRESS-MIB
        TEXTUAL-CONVENTION, TruthValue, DisplayString, RowPointer,
        StorageType, RowStatus
            FROM SNMPv2-TC
        MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
            FROM SNMPv2-CONF;


    bgpM2 MODULE-IDENTITY
        LAST-UPDATED "200202270000Z"
        ORGANIZATION "IETF IDR Working Group"
        CONTACT-INFO "E-mail:  idr@merit.net

                      Jeffrey Haas  (Editor)
                      825 Victors Way, Suite 100
                      Ann Arbor, MI  48108
                      Tel: +1 734 973-2200
                      Fax: +1 734 615-3241
                      E-mail: jhaas@nexthop.com"
```

```
        DESCRIPTION
            "This MIB module defines management objects for
             the Border Gateway Protocol, Version 4."
        ::= { mib-2 XXX }

    BgpM2Identifier ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "1d."
        STATUS       current
        DESCRIPTION
            "The representation of a BGP Identifier.  The BGP
             Identifier should be represented in the OCTET STRING
             as with the first OCTET of the string containing
             the first OCTET of the BGP Identifier received or sent
             in the OPEN packet and so on.

             Even though the BGP Identifier is trending away from
             an IP address it is still displayed as if it was one,
             even when it would be an illegal IP address."
        SYNTAX OCTET STRING(SIZE (4))


    BgpM2Safi ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS       current
        DESCRIPTION
            "The representation of a BGP Safi"
        SYNTAX Unsigned32(0..255)


    BgpM2Community ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "2d:"
        STATUS       current
        DESCRIPTION
            "The representation of a BGP Community."
        SYNTAX OCTET STRING(SIZE(4))


    BgpM2ExtendedCommunity ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "1x:1x:1x1x1x1x1x1x"
        STATUS       current
        DESCRIPTION
            "The representation of a BGP Extended Community."
        SYNTAX OCTET STRING(SIZE(8))


    bgpM2BaseScalars
        OBJECT IDENTIFIER ::= { bgp 1 }
```

```
    --
    -- Notifications
    --

    bgpM2BaseNotifications
        OBJECT IDENTIFIER ::= { bgpM2BaseScalars 0 }


    bgpM2Established NOTIFICATION-TYPE
        OBJECTS {
            bgpM2PeerLocalAddrType,
            bgpM2PeerLocalAddr,
            bgpM2PeerRemoteAddrType,
            bgpM2PeerRemoteAddr,
            bgpM2PeerLastErrorReceived,
            bgpM2PeerState
        }
        STATUS  current
        DESCRIPTION
            "The BGP Established event is generated when
             the BGP FSM enters the ESTABLISHED state."
        ::= { bgpM2BaseNotifications 1 }


    bgpM2BackwardTransition NOTIFICATION-TYPE
        OBJECTS {
            bgpM2PeerLocalAddrType,
            bgpM2PeerLocalAddr,
            bgpM2PeerRemoteAddrType,
            bgpM2PeerRemoteAddr,
            bgpM2PeerLastErrorReceived,
            bgpM2PeerLastErrorReceivedText,
            bgpM2PeerState
        }
        STATUS  current
        DESCRIPTION
            "The BGPBackwardTransition Event is generated
             when the BGP FSM moves from a higher numbered
             state to a lower numbered state."
        ::= { bgpM2BaseNotifications 2 }


    --
    -- BGP Supported Version Table
    --

    bgpM2Version
        OBJECT IDENTIFIER ::= { bgpM2BaseScalars 1 }
```

```
    bgpM2VersionTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2VersionEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table of supported BGP versions."
        ::= { bgpM2Version 1 }


    bgpM2VersionEntry OBJECT-TYPE
        SYNTAX     BgpM2VersionEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing data on a given supported version
             of the Border Gateway Protocol and the level of
             support provided.  It is expected that any agent
             implementation supporting this MIB module will
             report support for Version 4 of the Border Gateway
             Protocol at the very minimum."
        INDEX {
            bgpM2VersionIndex
        }
        ::= { bgpM2VersionTable 1 }


    BgpM2VersionEntry ::= SEQUENCE {
            bgpM2VersionIndex
                Unsigned32,
            bgpM2VersionSupported
                TruthValue
    }


    bgpM2VersionIndex OBJECT-TYPE
        SYNTAX     Unsigned32(0..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The version number of the BGP Protocol."
        ::= { bgpM2VersionEntry 1 }


    bgpM2VersionSupported OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
```

```
            "This value is TRUE if this version of the BGP protocol
             identified in 'bgpM2VersionIndex' is supported.  The absence
             of a row for a particular bgpM2VersionIndex indicates that
             that bgpM2VersionIndex protocol version number is not
             supported."
        ::= { bgpM2VersionEntry 2 }


    --
    -- Supported authentication mechanisms
    --

    bgpM2SupportedAuthentication
        OBJECT IDENTIFIER ::= { bgpM2BaseScalars 2 }


    bgpM2SupportedAuthTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2SupportedAuthEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The supported BGP authentication mechanisms."
        ::= { bgpM2SupportedAuthentication 1 }


    bgpM2SupportedAuthEntry OBJECT-TYPE
        SYNTAX     BgpM2SupportedAuthEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing information whether a given BGP
             authentication mechanism is supported by this
             implementation."
        INDEX {
            bgpM2SupportedAuthCode
        }
        ::= { bgpM2SupportedAuthTable 1 }


    BgpM2SupportedAuthEntry ::= SEQUENCE {
        bgpM2SupportedAuthCode
            Unsigned32,
        bgpM2SupportedAuthValue
            TruthValue
    }


    bgpM2SupportedAuthCode OBJECT-TYPE
```

```
        SYNTAX     Unsigned32(0..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The BGP authentication code."
        ::= { bgpM2SupportedAuthEntry 1 }


    bgpM2SupportedAuthValue OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is TRUE if a given authentication method
             is supported by the local implementation."
        ::= { bgpM2SupportedAuthEntry 2 }


    --
    -- Supported BGP Capabilities
    --

    bgpM2SupportedCapabilities
        OBJECT IDENTIFIER ::= { bgpM2BaseScalars 3 }


    bgpM2CapabilitySupportAvailable OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is TRUE if capability support is
             available and is enabled."
        ::= { bgpM2SupportedCapabilities 1 }


    bgpM2SupportedCapabilitiesTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2SupportedCapabilityEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table of supported BGP-4 capabilities."
        ::= { bgpM2SupportedCapabilities 2 }


    bgpM2SupportedCapabilitiesEntry OBJECT-TYPE
        SYNTAX     BgpM2SupportedCapabilityEntry
        MAX-ACCESS not-accessible
```

```
        STATUS     current
        DESCRIPTION
            "Information about supported capabilities indexed
             by capability number."
        INDEX {
            bgpM2SupportedCapabilityCode
        }
        ::= { bgpM2SupportedCapabilitiesTable 1 }


    BgpM2SupportedCapabilityEntry ::= SEQUENCE {
        bgpM2SupportedCapabilityCode
            Unsigned32,
        bgpM2SupportedCapability
            TruthValue
    }


    bgpM2SupportedCapabilityCode OBJECT-TYPE
        SYNTAX     Unsigned32 (0..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Index of supported capability.  The index directly
             corresponds with the BGP-4 Capability Advertisement
             Capability Code."
        ::= { bgpM2SupportedCapabilitiesEntry 1 }


    bgpM2SupportedCapability OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is True if this capability is supported,
             False otherwise."
        ::= { bgpM2SupportedCapabilitiesEntry 2 }


    --
    -- Base Scalars
    --


    bgpM2AsSize OBJECT-TYPE
        SYNTAX     INTEGER {
            twoOctet(1),
            fourOctet(2)
```

```
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The size of the AS value in this implementation.

             The semantics of this are determined as per the
             as-4bytes draft."
        REFERENCE
            "draft-ietf-idr-as4bytes-04"
        ::= { bgpM2BaseScalars 4 }


    bgpM2LocalAs OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The local autonomous system number.

             If the bgpM2AsSize is twoOctet, then the range is
             constrained to be 0-65535."
        ::= { bgpM2BaseScalars 5 }


    bgpM2LocalIdentifier OBJECT-TYPE
        SYNTAX     BgpM2Identifier
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The BGP Identifier of local system.

             Current practice is trending away from this value being
             treated as an IP address and more as a generic
             identifier."
        ::= { bgpM2BaseScalars 6 }


    --
    -- Base Scalar Extensions
    --

    bgpM2BaseScalarExtensions
        OBJECT IDENTIFIER ::= { bgpM2BaseScalars 7 }


    bgpM2BaseScalarNonCapExts
        OBJECT IDENTIFIER ::= { bgpM2BaseScalarExtensions 1 }
```

```
    bgpM2BaseScalarCapExts
        OBJECT IDENTIFIER ::= { bgpM2BaseScalarExtensions 2 }


    --
    -- Base Scalar Route Reflection Extensions
    --

    bgpM2BaseScalarRouteReflectExts OBJECT IDENTIFIER ::=
        { bgpM2BaseScalarNonCapExts 2796 }


    bgpM2RouteReflector OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This value is TRUE if this implementation supports the
             BGP Route Reflection Extension and is enabled as a
             route reflector.  If the BGP Route Reflection extension
             is not supported this value must be FALSE."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2BaseScalarRouteReflectExts 1 }


    bgpM2ClusterId OBJECT-TYPE
        SYNTAX      BgpM2Identifier
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The configured Cluster-ID of the BGP Speaker.  This will
             default to the BGP Speaker's BgpM2Identifier if this
             speaker is functioning as a route reflector and an
             explicit Cluster-ID has not been configured.

             A value of 0.0.0.0 will be present if Route Reflection is
             not enabled."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2BaseScalarRouteReflectExts 2 }


    --
    -- Base Scalar AS Confederation Extensions
    --

    bgpM2BaseScalarASConfedExts OBJECT IDENTIFIER ::=
```

```
          { bgpM2BaseScalarNonCapExts 3065 }


    bgpM2ConfederationRouter OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is TRUE if this implementation supports the
             BGP AS Confederations Extension and this router is
             configured to be in a confederation."
        REFERENCE
            "RFC 3065 - Autonomous System Confederations for BGP"
        ::= { bgpM2BaseScalarASConfedExts 1 }


    bgpM2ConfederationId OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The local Confederation Identification Number.

             This value will be zero (0) if this BGP Speaker is not
             a confederation router."
        REFERENCE
            "RFC 3065 - Autonomous System Confederations for BGP"
        ::= { bgpM2BaseScalarASConfedExts 2 }


    --
    -- Base Configuration Objects
    --

    bgpM2BaseScalarConfiguration
        OBJECT IDENTIFIER ::= { bgpM2BaseScalars 8 }


    bgpM2CfgBaseScalarStorageType OBJECT-TYPE
        SYNTAX     StorageType
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
            "This object specifies the intended storage type for
             all configurable base scalars."
        ::= { bgpM2BaseScalarConfiguration 1 }
```

```
    bgpM2CfgLocalAs OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
            "The local autonomous system number.

             If the bgpM2AsSize is twoOctet, then the range is
             constrained to be 0-65535."
        ::= { bgpM2BaseScalarConfiguration 2 }


    bgpM2CfgLocalIdentifier OBJECT-TYPE
        SYNTAX     BgpM2Identifier
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
            "The BGP Identifier of local system.

             Current practice is trending away from this value being
             treated as an IP address and more as a generic
             identifier."
        ::= { bgpM2BaseScalarConfiguration 3 }


    --
    -- Base Scalar Extensions
    --

    bgpM2CfgBaseScalarExtensions
        OBJECT IDENTIFIER ::= { bgpM2BaseScalarConfiguration 4 }


    bgpM2CfgBaseScalarNonCapExts
        OBJECT IDENTIFIER ::= { bgpM2CfgBaseScalarExtensions 1 }


    bgpM2CfgBaseScalarCapExts
        OBJECT IDENTIFIER ::= { bgpM2CfgBaseScalarExtensions 2 }


    --
    -- Base Scalar Route Reflection Extensions
    --

    bgpM2CfgBaseScalarReflectorExts
        OBJECT IDENTIFIER ::= { bgpM2CfgBaseScalarNonCapExts 2796 }
```

```
    bgpM2CfgRouteReflector OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "This value is set to true if this implementation will
             be supporting route reflection."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2CfgBaseScalarReflectorExts 1 }


    bgpM2CfgClusterId OBJECT-TYPE
        SYNTAX      BgpM2Identifier
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The configured Cluster-ID of the BGP Speaker.  This will
             default to the BGP Speaker's BgpM2Identifier if this
             speaker is functioning as a route reflector and an
             explicit Cluster-ID has not been configured.

             A value of 0.0.0.0 will be present if Route Reflection is
             not enabled."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2CfgBaseScalarReflectorExts 2 }


    --
    -- Base Scalar AS Confederation Extensions
    --

    bgpM2CfgBaseScalarASConfedExts
        OBJECT IDENTIFIER ::= { bgpM2CfgBaseScalarNonCapExts 3065 }


    bgpM2CfgConfederationRouter OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
            "This value is set to true if this implementation will be
             supporting BGP AS Confederations."
        REFERENCE
            "RFC 3065 - Autonomous System Confederations for BGP"
        ::= { bgpM2CfgBaseScalarASConfedExts 1 }
```

```
    bgpM2CfgConfederationId OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-write
        STATUS     current
        DESCRIPTION
            "The local Confederation Identification Number.

             This value will be zero (0) if this BGP Speaker is not
             a confederation router."
        REFERENCE
            "RFC 3065 - Autonomous System Confederations for BGP"
        ::= { bgpM2CfgBaseScalarASConfedExts 2 }


    --
    -- BGP Peer Data
    --

    bgpM2Peer
        OBJECT IDENTIFIER ::= { bgp 2 }


    bgpM2PeerData
        OBJECT IDENTIFIER ::= { bgpM2Peer 1 }


    bgpM2PeerTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "BGP peer table.

             This table contains, one entry per BGP peer,
             and information about the connections with BGP
             peers."
        ::= { bgpM2PeerData 1 }


    bgpM2PeerEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing information about the connection with
             a BGP peer."
        INDEX {
            bgpM2PeerLocalAddrType,
```

```
            bgpM2PeerLocalAddr,
            bgpM2PeerRemoteAddrType,
            bgpM2PeerRemoteAddr
        }
        ::= { bgpM2PeerTable 1 }


    BgpM2PeerEntry ::= SEQUENCE {
        bgpM2PeerIdentifier
            BgpM2Identifier,
        bgpM2PeerState
            INTEGER,
        bgpM2PeerStatus
            INTEGER,
        bgpM2PeerConfiguredVersion
            Unsigned32,
        bgpM2PeerNegotiatedVersion
            Unsigned32,
        bgpM2PeerLocalAddrType
            InetAddressType,
        bgpM2PeerLocalAddr
            InetAddress,
        bgpM2PeerLocalPort
            InetPortNumber,
        bgpM2PeerLocalAs
            InetAutonomousSystemNumber,
        bgpM2PeerRemoteAddrType
            InetAddressType,
        bgpM2PeerRemoteAddr
            InetAddress,
        bgpM2PeerRemotePort
            InetPortNumber,
        bgpM2PeerRemoteAs
            InetAutonomousSystemNumber,
        bgpM2PeerIndex
            Unsigned32
    }


    bgpM2PeerIdentifier OBJECT-TYPE
        SYNTAX     BgpM2Identifier
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The BGP Identifier of this entry's BGP peer.

             This entry should be 0.0.0.0 unless the bgpM2PeerState is
             in the OpenConfirm or the Established state."
```

```
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 4.2"
        ::= { bgpM2PeerEntry 1 }


    bgpM2PeerState OBJECT-TYPE
        SYNTAX     INTEGER {
            idle(1),
            connect(2),
            active(3),
            opensent(4),
            openconfirm(5),
            established(6)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The BGP peer's FSM state."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 8"
        ::= { bgpM2PeerEntry 2 }


    bgpM2PeerStatus OBJECT-TYPE
        SYNTAX     INTEGER {
            halted(1),
            running(2)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Whether or not the BGP FSM for this peer is halted or
             running.  The BGP FSM for a peer is halted after
             processing a Stop event.  Likewise, it is in the running
             state after a Start event.

             The bgpM2PeerState will generally be in the idle state when
             the FSM is halted, although some extensions such as
             Graceful Restart will leave the peer in the Idle state
             but with the FSM running."
        ::= { bgpM2PeerEntry 3 }


    bgpM2PeerConfiguredVersion OBJECT-TYPE
        SYNTAX     Unsigned32 (1..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
```

```
            "The configured version to originally start with this
             peer.  The BGP speaker may permit negotiation to a
             lower version number of the protocol."
        ::= { bgpM2PeerEntry 4 }


    bgpM2PeerNegotiatedVersion OBJECT-TYPE
        SYNTAX     Unsigned32 (1..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The negotiated version of BGP running between the two
             peers."
        ::= { bgpM2PeerEntry 5 }


    bgpM2PeerLocalAddrType OBJECT-TYPE
        SYNTAX     InetAddressType
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The address family of the local end of the peering
             session."
        ::= { bgpM2PeerEntry 6 }


    bgpM2PeerLocalAddr OBJECT-TYPE
        SYNTAX     InetAddress (SIZE(4..20))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The address of the local end of the peering session."
        ::= { bgpM2PeerEntry 7 }


    bgpM2PeerLocalPort OBJECT-TYPE
        SYNTAX     InetPortNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The local port for the TCP connection between the BGP
             peers."
        ::= { bgpM2PeerEntry 8 }


    bgpM2PeerLocalAs OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
```

```
        STATUS     current
        DESCRIPTION
            "Some implementations of BGP can represent themselves
             as multiple ASs.  This is the AS that this peering
             session is representing itself as to the remote peer."
        ::= { bgpM2PeerEntry 9 }


    bgpM2PeerRemoteAddrType OBJECT-TYPE
        SYNTAX     InetAddressType
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The address family of the remote end of the peering
             session."
        ::= { bgpM2PeerEntry 10 }


    bgpM2PeerRemoteAddr OBJECT-TYPE
        SYNTAX     InetAddress (SIZE(4..20))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The address of the remote end of the peering session."
        ::= { bgpM2PeerEntry 11 }


    bgpM2PeerRemotePort OBJECT-TYPE
        SYNTAX     InetPortNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The remote port for the TCP connection between the BGP
             peers.  In the case of a transport for which the notion
             of 'port' is irrelevant, an instance value of -1
             should be returned by the agent for this object.

             Note that the objects bgpM2PeerLocalAddr,
             bgpM2PeerLocalPort, bgpM2PeerRemoteAddr and
             bgpM2PeerRemotePort provide the appropriate reference to
             the standard MIB TCP connection table. or even the ipv6
             TCP MIB as in rfc2452."
        REFERENCE
            "RFC 2012 - SNMPv2 Management Information Base for the
             Transmission Control Protocol using SMIv2.
             RFC 2542 - IP Version 6 Management Information Base
             for the Transmission Control Protocol."
        ::= { bgpM2PeerEntry 12 }
```

```
    bgpM2PeerRemoteAs OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The remote autonomous system number."
        ::= { bgpM2PeerEntry 13 }


    bgpM2PeerIndex OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This value is a unique index for the peer entry in the
             bgpM2PeerTable.  It is assigned by the agent at the point
             of creation of the bgpM2PeerTable row entry.  While its
             value is guaranteed to be unique at any time, it is
             otherwise opaque to the management application with
             respect to its value or the contiguity of bgpM2PeerIndex
             row instance values across rows of the bgpM2PeerTable.  It
             is used to provide an index structure for other tables
             whose data is logically per-peer.

             For explicitly configured peers, this value will remain
             consistent until this row is deleted by deleting the
             configured peers.  Unconfigured peers will generate
             a monotonically increasing number when a BGP FSM is
             built to process the peering session.  Values in the
             bgpM2PeerTable and other tables utilizing bgpM2PeerIndex
             are expected to remain in existence for an arbitrary
             time after the unconfigured peer has been deleted
             in order to allow management applications to extract
             useful management information for those peers.  Thus,
             an unconfigured peer using the same indices as the
             bgpM2PeerTable that comes up while this row still
             exists will re-utilize the same row."
         ::= { bgpM2PeerEntry 14 }


    --
    -- Errors
    --

    bgpM2PeerErrors
        OBJECT IDENTIFIER ::= { bgpM2Peer 2 }

    bgpM2PeerErrorsTable OBJECT-TYPE
```

```
        SYNTAX     SEQUENCE OF BgpM2PeerErrorsEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "On a per peer basis, this table reflects the last
             protocol-defined error encountered and reported on
             the peer session.  If no entry for a given peer,
             by its bgpM2PeerIndex, exists in this table, then no
             such errors have been observed, reported, and
             recorded on the  session."
        ::= { bgpM2PeerErrors 1 }


    bgpM2PeerErrorsEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerErrorsEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each entry contains information about errors sent
             and received for a particular BGP peer."
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerErrorsTable 1 }


    BgpM2PeerErrorsEntry ::= SEQUENCE {
        bgpM2PeerLastErrorReceived
            OCTET STRING,
        bgpM2PeerLastErrorSent
            OCTET STRING,
        bgpM2PeerLastErrorReceivedTime
            TimeTicks,
        bgpM2PeerLastErrorSentTime
            TimeTicks,
        bgpM2PeerLastErrorReceivedText
            DisplayString,
        bgpM2PeerLastErrorSentText
            DisplayString,
        bgpM2PeerLastErrorReceivedData
            OCTET STRING,
        bgpM2PeerLastErrorSentData
            OCTET STRING
    }


    bgpM2PeerLastErrorReceived OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE (2))
```

```
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The last error code and subcode received by this BGP
             Speaker via a NOTIFICATION message for this peer.
             If no error has occurred, this field is zero.
             Otherwise, the first byte of this two byte
             OCTET STRING contains the error code, and the second
             byte contains the subcode."
        REFERENCE
            "draft-ietf-idr-bgp4-15.txt, Sec. 4.5"
        ::= { bgpM2PeerErrorsEntry 1 }


    bgpM2PeerLastErrorSent OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE (2))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The last error code and subcode sent by this BGP
             Speaker via a NOTIFICATION message to this peer.
             If no error has occurred, this field is zero.
             Otherwise, the first byte of this two byte
             OCTET STRING contains the error code, and the second
             byte contains the subcode."
        REFERENCE
            "draft-ietf-idr-bgp4-15.txt, Sec. 4.5"
        ::= { bgpM2PeerErrorsEntry 2 }


    bgpM2PeerLastErrorReceivedTime OBJECT-TYPE
        SYNTAX     TimeTicks
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The timestamp that the last NOTIFICATION was received from
             this peer."
        REFERENCE
            "draft-ietf-idr-bgp4-15.txt, Sec. 4.5"
        ::= { bgpM2PeerErrorsEntry 3 }


    bgpM2PeerLastErrorSentTime OBJECT-TYPE
        SYNTAX     TimeTicks
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The timestamp that the last NOTIFICATION was sent to
```

```
            this peer."
        REFERENCE
            "draft-ietf-idr-bgp4-15.txt, Sec. 4.5"
        ::= { bgpM2PeerErrorsEntry 4 }


    bgpM2PeerLastErrorReceivedText OBJECT-TYPE
        SYNTAX     DisplayString
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object contains an implementation specific
             explanation of the error that was reported."
        ::= { bgpM2PeerErrorsEntry 5 }


    bgpM2PeerLastErrorSentText OBJECT-TYPE
        SYNTAX     DisplayString
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object contains an implementation specific
             explanation of the error that is being reported."
        ::= { bgpM2PeerErrorsEntry 6 }


    bgpM2PeerLastErrorReceivedData OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE(0..4075))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The last error code's data seen by this peer."
        REFERENCE
            "draft-ietf-idr-bgp4-15.txt, Sec. 4.5"
        ::= { bgpM2PeerErrorsEntry 7 }


    bgpM2PeerLastErrorSentData OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE(0..4075))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The last error code's data sent to this peer."
        REFERENCE
            "draft-ietf-idr-bgp4-15.txt, Sec. 4.5"
        ::= { bgpM2PeerErrorsEntry 8 }
```

```
    --
    -- Peer Authentication
    --

    bgpM2PeerAuthentication
        OBJECT IDENTIFIER ::= { bgpM2Peer 3 }


    bgpM2PeerAuthTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerAuthEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "BGP peer authentication table.

             This table contains, one entry per BGP peer,
             information about the authentication with BGP peers."
        ::= { bgpM2PeerAuthentication 1 }


    bgpM2PeerAuthEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerAuthEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing information about the authentication
             with a BGP peer."
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerAuthTable 1 }


    BgpM2PeerAuthEntry ::= SEQUENCE {
        bgpM2PeerAuthSent
            TruthValue,
        bgpM2PeerAuthSentCode
            Unsigned32,
        bgpM2PeerAuthSentValue
            OCTET STRING,
        bgpM2PeerAuthRcvd
            TruthValue,
        bgpM2PeerAuthRcvdCode
            Unsigned32,
        bgpM2PeerAuthRcvdValue
            OCTET STRING
    }
```

```
    bgpM2PeerAuthSent OBJECT-TYPE
        SYNTAX TruthValue
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The local peer has sent authentication information
             to the remote peer in the BGP Authentication field."
        ::= { bgpM2PeerAuthEntry 1 }


     bgpM2PeerAuthSentCode OBJECT-TYPE
        SYNTAX  Unsigned32 (0..255)
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The code of the authentication information sent to
             the remote peer."
        ::= { bgpM2PeerAuthEntry 2 }


    bgpM2PeerAuthSentValue OBJECT-TYPE
        SYNTAX  OCTET STRING (SIZE (0..252))
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The payload of the authentication information
             from the remote peer."
        ::= { bgpM2PeerAuthEntry 3 }


    bgpM2PeerAuthRcvd OBJECT-TYPE
        SYNTAX TruthValue
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The local peer has received authentication information
             from the remote peer in the BGP Authentication field."
        ::= { bgpM2PeerAuthEntry 4 }


    bgpM2PeerAuthRcvdCode OBJECT-TYPE
        SYNTAX  Unsigned32 (0..255)
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The code of the authentication information received from
             the remote peer."
        ::= { bgpM2PeerAuthEntry 5 }
```

```
    bgpM2PeerAuthRcvdValue OBJECT-TYPE
        SYNTAX  OCTET STRING (SIZE (0..252))
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The payload of the authentication information from
            the remote peer."
        ::= { bgpM2PeerAuthEntry 6 }


    --
    -- Peer Event Times
    --

    bgpM2PeerTimers
        OBJECT IDENTIFIER ::= { bgpM2Peer 4 }


    bgpM2PeerEventTimesTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerEventTimesEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "A table reporting the per-peering session amount
             of time elapsed and update events since the peering
             session advanced into the Established state."
        ::= { bgpM2PeerTimers 1 }


    bgpM2PeerEventTimesEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerEventTimesEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each row contains a set of statistics about time
             spent and events encountered in the peer session
             Established state."
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerEventTimesTable 1 }


    BgpM2PeerEventTimesEntry ::= SEQUENCE {
        bgpM2PeerFsmEstablishedTime
            Gauge32,
        bgpM2PeerInUpdatesElapsedTime
            Gauge32
```

```
    }


    bgpM2PeerFsmEstablishedTime OBJECT-TYPE
        SYNTAX     Gauge32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This timer indicates how long (in seconds) this
             peer has been in the Established state or how long
             since this peer was last in the Established state.
             It is set to zero when a new peer is configured or
             the router is booted."
        ::= { bgpM2PeerEventTimesEntry 1 }


    bgpM2PeerInUpdatesElapsedTime OBJECT-TYPE
        SYNTAX     Gauge32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Elapsed time in seconds since the last BGP UPDATE
             message was received from the peer.  Each time
             bgpM2PeerInUpdates is incremented, the value of this
             object is set to zero (0).  This value shall also be
             zero (0) when the peer is not in the Established state"
        ::= { bgpM2PeerEventTimesEntry 2 }


    --
    -- Peer Configured Timers
    --

    bgpM2PeerConfiguredTimersTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerConfiguredTimersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Per peer management data on BGP session timers."
        ::= { bgpM2PeerTimers 2 }

    bgpM2PeerConfiguredTimersEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerConfiguredTimersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each entry corresponds to the current state of
             BGP timers on a given peering session."
```

```
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerConfiguredTimersTable 1 }


    BgpM2PeerConfiguredTimersEntry ::= SEQUENCE {
        bgpM2PeerConnectRetryInterval
            Unsigned32,
        bgpM2PeerHoldTimeConfigured
            Unsigned32,
        bgpM2PeerKeepAliveConfigured
            Unsigned32,
        bgpM2PeerMinASOrigInterval
            Unsigned32,
        bgpM2PeerMinRouteAdverInterval
            Unsigned32
    }


    bgpM2PeerConnectRetryInterval OBJECT-TYPE
        SYNTAX     Unsigned32 (1..65535)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the ConnectRetry
             timer.  The suggested value for this timer is 120
             seconds."
        ::= { bgpM2PeerConfiguredTimersEntry 1 }


    bgpM2PeerHoldTimeConfigured OBJECT-TYPE
        SYNTAX     Unsigned32 ( 0 | 3..65535 )
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the Hold Time configured
             for this BGP speaker with this peer.  This value
             is placed in an OPEN message sent to this peer by
             this BGP speaker, and is compared with the Hold
             Time field in an OPEN message received from the
             peer when determining the Hold Time (bgpM2PeerHoldTime)
             with the peer.  This value must not be less than
             three seconds if it is not zero (0) in which case
             the Hold Time is NOT to be established with the
             peer.  The suggested value for this timer is 90
             seconds."
        REFERENCE
```

```
            "draft-ietf-idr-bgp4-17.txt, Appendix 6.4"
        ::= { bgpM2PeerConfiguredTimersEntry 2 }


    bgpM2PeerKeepAliveConfigured OBJECT-TYPE
        SYNTAX     Unsigned32 ( 0 | 1..21845 )
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the KeepAlive timer
             configured for this BGP speaker with this peer.
             The value of this object will only determine the
             KEEPALIVE messages frequency relative to the value
             specified in bgpM2PeerHoldTimeConfigured; the actual
             time interval for the KEEPALIVE messages is indicated
             by bgpM2PeerKeepAlive.  A reasonable maximum value
             for this timer would be configured to be one third
             of that of bgpM2PeerHoldTimeConfigured.

             If the value of this object is zero (0), no
             periodical KEEPALIVE messages are sent to the peer
             after the BGP connection has been established.
             The suggested value for this timer is 30 seconds."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Appendix 6.4"
        ::= { bgpM2PeerConfiguredTimersEntry 3 }


    bgpM2PeerMinASOrigInterval OBJECT-TYPE
        SYNTAX     Unsigned32 (0..65535)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the MinASOriginationInterval
             timer.  The suggested value for this timer is 15
             seconds."
        ::= { bgpM2PeerConfiguredTimersEntry 4 }


    bgpM2PeerMinRouteAdverInterval OBJECT-TYPE
        SYNTAX     Unsigned32 (0..65535)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the
             MinRouteAdvertisementInterval timer.  The suggested
             value for this timer is 30 seconds."
        ::= { bgpM2PeerConfiguredTimersEntry 5 }
```

```
    --
    -- Peer Negotiated Timers
    --

    bgpM2PeerNegotiatedTimersTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerNegotiatedTimersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Current values of per-peer timers which can be
             dynamically set in the bgpM2PeerConfiguredTimersTable.
             Values reflected in this table are the current
             operational values, after negotiation from values
             derived from initial configuration or last set from
             bgpM2PeerConfiguredTimersTable row instances."
        ::= { bgpM2PeerTimers 3 }


    bgpM2PeerNegotiatedTimersEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerNegotiatedTimersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each entry reflects a value of the currently
             operational, negotiated timers as reflected in the
             BgpM2PeerNegotiatedTimersEntry."
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerNegotiatedTimersTable 1 }


    BgpM2PeerNegotiatedTimersEntry ::= SEQUENCE {
        bgpM2PeerHoldTime
            Unsigned32,
        bgpM2PeerKeepAlive
            Unsigned32
    }


    bgpM2PeerHoldTime OBJECT-TYPE
        SYNTAX     Unsigned32  ( 0 | 3..65535 )
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The value of this object is calculated by this BGP
             Speaker as being;
```

```
            zero (0) - if this was the value sent by the peer and
            this value is permitted by this BGP Speaker.  In this
            case, no keepalive messages are sent and the Hold Timer
            is not set.

            At least three (3).  This value is the smaller of
            the value sent by this peer in the OPEN message and
            bgpM2PeerHoldTimeConfigured for this peer.

            This value is only defined when the peering session is
            in the Established state."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 4.2"
        ::= { bgpM2PeerNegotiatedTimersEntry 1 }


    bgpM2PeerKeepAlive OBJECT-TYPE
        SYNTAX     Unsigned32 ( 0 | 1..21845 )
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the KeepAlive timer
             established with the peer.  The value of this object
             is calculated by this BGP speaker such that, when
             compared with bgpM2PeerHoldTime, it has the same
             proportion as what bgpM2PeerKeepAliveConfigured has
             when compared with bgpM2PeerHoldTimeConfigured.  If
             the value of this object is zero (0), it indicates
             that the KeepAlive timer has not been established
             with the peer, or, the value of
             bgpM2PeerKeepAliveConfigured is zero (0).

             This value is only defined when the peering session is
             in the Established state."
        REFERENCE
            "draft-ietf-idr-bgp4-17, Sec. 4.4"
        ::= { bgpM2PeerNegotiatedTimersEntry 2 }


    --
    -- Peer Capabilities
    --

    bgpM2PeerCapabilities
        OBJECT IDENTIFIER ::= { bgpM2Peer 5 }


    --
```

```
    -- Announced Capabilities
    --

    bgpM2PeerCapsAnnouncedTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerCapsAnnouncedEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "This table contains the capabilities
             that are supported for a given peer."
        ::= { bgpM2PeerCapabilities 1 }


    bgpM2PeerCapsAnnouncedEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerCapsAnnouncedEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "These entries are keyed by a BGP-4 peer remote
             address and the BGP Capability Code"
        INDEX {
            bgpM2PeerIndex,
            bgpM2PeerCapAnnouncedCode,
            bgpM2PeerCapAnnouncedIndex
        }
        ::= { bgpM2PeerCapsAnnouncedTable 1 }


    BgpM2PeerCapsAnnouncedEntry ::= SEQUENCE {
        bgpM2PeerCapAnnouncedCode
            Unsigned32,
        bgpM2PeerCapAnnouncedIndex
            Unsigned32,
        bgpM2PeerCapAnnouncedValue
            OCTET STRING
    }


    bgpM2PeerCapAnnouncedCode OBJECT-TYPE
        SYNTAX     Unsigned32 (0..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The BGP Capability Advertisement Capability Code."
        ::= { bgpM2PeerCapsAnnouncedEntry 1 }


    bgpM2PeerCapAnnouncedIndex OBJECT-TYPE
```

```
        SYNTAX     Unsigned32 (1..128)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Multiple instances of a given capability may be sent
             bgp a BGP speaker.  This variable is used to index them."
        ::= { bgpM2PeerCapsAnnouncedEntry 2 }


    bgpM2PeerCapAnnouncedValue OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE(0..255))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The value of the announced capability."
        ::= { bgpM2PeerCapsAnnouncedEntry 3 }


    --
    -- Received Capabilities
    --

    bgpM2PeerCapsReceivedTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM24PeerCapsReceivedEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "This table contains the capabilities
            that are supported for a given peer."
        ::= { bgpM2PeerCapabilities 2 }


    bgpM2PeerCapsReceivedEntry OBJECT-TYPE
        SYNTAX     BgpM24PeerCapsReceivedEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "These entries are keyed by a BGP-4 peer remote
            address and the BGP Capability Code"
        INDEX {
            bgpM2PeerIndex,
            bgpM2PeerCapReceivedCode,
            bgpM2PeerCapReceivedIndex
        }
        ::= { bgpM2PeerCapsReceivedTable 1 }


    BgpM24PeerCapsReceivedEntry ::= SEQUENCE {
```

```
        bgpM2PeerCapReceivedCode
            Unsigned32,
        bgpM2PeerCapReceivedIndex
            Unsigned32,
        bgpM2PeerCapReceivedValue
            OCTET STRING
    }


    bgpM2PeerCapReceivedCode OBJECT-TYPE
        SYNTAX     Unsigned32 (0..255)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The BGP Capability Advertisement Capability Code."
        ::= { bgpM2PeerCapsReceivedEntry 1 }


    bgpM2PeerCapReceivedIndex OBJECT-TYPE
        SYNTAX     Unsigned32 (1..128)
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Multiple instances of a given capability may be sent
             bgp a BGP speaker.  This variable is used to index them."
        ::= { bgpM2PeerCapsReceivedEntry 2 }


    bgpM2PeerCapReceivedValue OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE(0..255))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The value of the announced capability."
        ::= { bgpM2PeerCapsReceivedEntry 3 }


    --
    -- Per-peer counters
    --

    bgpM2PeerCounters
        OBJECT IDENTIFIER ::= { bgpM2Peer 6 }


    bgpM2PeerCountersTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerCountersEntry
        MAX-ACCESS not-accessible
```

```
        STATUS     current
        DESCRIPTION
            "The counters associated with a BGP Peer."
        ::= { bgpM2PeerCounters 1 }


    bgpM2PeerCountersEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerCountersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each entry contains counters of message transmissions
             and FSM transitions for a given BGP Peering session."
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerCountersTable 1 }


    BgpM2PeerCountersEntry ::= SEQUENCE {
        bgpM2PeerInUpdates
            Counter32,
        bgpM2PeerOutUpdates
            Counter32,
        bgpM2PeerInTotalMessages
            Counter32,
        bgpM2PeerOutTotalMessages
            Counter32,
        bgpM2PeerFsmEstablishedTrans
            Counter32
    }


-- +++wayne need to describe what happens if connection is broken
-- and then reestablished. Does the prior counter value accumulate?
    bgpM2PeerInUpdates OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of BGP UPDATE messages received on this
             connection.  This object should be initialized to zero
             (0) when the connection is established."
        ::= { bgpM2PeerCountersEntry 1 }


    bgpM2PeerOutUpdates OBJECT-TYPE
        SYNTAX     Counter32
```

```
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of BGP UPDATE messages transmitted on this
             connection.  This object should be initialized to zero
             (0) when the connection is established."
        ::= { bgpM2PeerCountersEntry 2 }


    bgpM2PeerInTotalMessages OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The total number of messages received from the remote
             peer on this connection.  This object should be
             initialized to zero when the connection is established."
        ::= { bgpM2PeerCountersEntry 3 }


    bgpM2PeerOutTotalMessages OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The total number of messages transmitted to the remote
             peer on this connection.  This object should be
             initialized to zero when the connection is established."
        ::= { bgpM2PeerCountersEntry 4 }


    bgpM2PeerFsmEstablishedTrans OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
        "The total number of times the BGP FSM
        transitioned into the established state
        for this peer."
        ::= { bgpM2PeerCountersEntry 5 }


    --
    -- Per-Peer Prefix Counters
    --

    bgpM2PrefixCountersTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PrefixCountersEntry
```

```
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Additional per-peer, per AFI SAFI counters for prefixes"
        ::= { bgpM2PeerCounters 2 }


    bgpM2PrefixCountersEntry OBJECT-TYPE
        SYNTAX     BgpM2PrefixCountersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing information about a bgp-peers prefix
             counters."
        INDEX {
            bgpM2PeerIndex,
            bgpM2PrefixCountersAfi,
            bgpM2PrefixCountersSafi
        }
        ::= { bgpM2PrefixCountersTable 1 }


    BgpM2PrefixCountersEntry ::= SEQUENCE {
        bgpM2PrefixCountersAfi
            InetAddressType,
        bgpM2PrefixCountersSafi
            BgpM2Safi,
        bgpM2PrefixInPrefixes
            Gauge32,
        bgpM2PrefixInPrefixesAccepted
            Gauge32,
        bgpM2PrefixInPrefixesRejected
            Gauge32,
        bgpM2PrefixOutPrefixes
            Gauge32
    }


    bgpM2PrefixCountersAfi OBJECT-TYPE
        SYNTAX     InetAddressType
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The AFI index of the per-peer, per prefix counters"
        ::= { bgpM2PrefixCountersEntry 1 }


    bgpM2PrefixCountersSafi OBJECT-TYPE
```

```
        SYNTAX     BgpM2Safi
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The SAFI index of the per-peer, per prefix counters"
        ::= { bgpM2PrefixCountersEntry 2 }


    bgpM2PrefixInPrefixes OBJECT-TYPE
        SYNTAX     Gauge32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of prefixes received from a peer and are
             stored in the Adj-Ribs-In for that peer."
             -- jmh - note that we are allowing stuff to be discarded
        ::= { bgpM2PrefixCountersEntry 7 }


    bgpM2PrefixInPrefixesAccepted OBJECT-TYPE
        SYNTAX     Gauge32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of prefixes for a peer that are installed
             in the Adj-Ribs-In and are eligible to become active
             in the Loc-Rib."
        ::= { bgpM2PrefixCountersEntry 8 }


    bgpM2PrefixInPrefixesRejected OBJECT-TYPE
        SYNTAX     Gauge32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of prefixes for a peer that are installed
             in the Adj-Ribs-In and are NOT eligible to become active
             in the Loc-Rib."
        ::= { bgpM2PrefixCountersEntry 9 }


    bgpM2PrefixOutPrefixes OBJECT-TYPE
        SYNTAX     Gauge32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The number of prefixes for a peer that are installed
             in that peers Adj-Ribs-Out."
```

```
        ::= { bgpM2PrefixCountersEntry 10 }


    bgpM2PeerExtensions
        OBJECT IDENTIFIER ::= { bgpM2Peer 7 }


    bgpM2PeerNonCapExts
        OBJECT IDENTIFIER ::= { bgpM2PeerExtensions 1 }


    bgpM2PeerCapExts
        OBJECT IDENTIFIER ::= { bgpM2PeerExtensions 2 }


    --
    -- Peer Route Reflection Extensions
    --

    bgpM2PeerRouteReflectionExts
        OBJECT IDENTIFIER ::= { bgpM2PeerNonCapExts 2796 }


    bgpM2PeerReflectorClientTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerReflectorClientEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table of route reflection client settings on a per-peer
             basis."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2PeerRouteReflectionExts 1 }


    bgpM2PeerReflectorClientEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerReflectorClientEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing data on a per-peer basis on whether
             the peer is configured as a route reflector client."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        AUGMENTS {
            bgpM2PeerEntry
        }
```

```
        ::= { bgpM2PeerReflectorClientTable 1 }


    BgpM2PeerReflectorClientEntry ::= SEQUENCE {
        bgpM2PeerReflectorClient
            INTEGER
    }

    bgpM2PeerReflectorClient OBJECT-TYPE
        SYNTAX    INTEGER {
            nonClient(0),
            client(1),
            meshedClient(2)
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This value indicates whether the given peer is a
             reflector client of this router, or not.  A value of
             nonClient indicates that this peer is not a reflector
             client.  A value of client indicates that this peer is a
             reflector client that is not fully meshed with other
             reflector clients.  A value of meshedClient indicates
             that the peer is a reflector client and is fully meshed
             with all other reflector clients.

             This value must be nonClient (0) for BGP external peers."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2PeerReflectorClientEntry 1 }


    --
    -- Peer AS Confederations Extensions
    --

    bgpM2PeerASConfederationExts
        OBJECT IDENTIFIER ::= { bgpM2PeerNonCapExts 3065 }


    bgpM2PeerConfedMemberTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PeerConfedMemberEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table of confederation member settings on a per-peer
             basis."
        REFERENCE
```

```
            "RFC 3065 - BGP Confederations"
        ::= { bgpM2PeerASConfederationExts 1 }


    bgpM2PeerConfedMemberEntry OBJECT-TYPE
        SYNTAX     BgpM2PeerConfedMemberEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing data on a per-peer basis on whether
             the peer is configured as a BGP confederation member."
        REFERENCE
            "RFC 3065 - BGP Confederations"
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2PeerConfedMemberTable 1 }


    BgpM2PeerConfedMemberEntry ::= SEQUENCE {
        bgpM2PeerConfedMember
            TruthValue
    }


    bgpM2PeerConfedMember OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This value indicates whether the given peer is in our
             confederation or not."
        REFERENCE
            "RFC 3065 - BGP Confederations"
        ::= { bgpM2PeerConfedMemberEntry 1 }


    --
    -- Peer configuration objects
    --

    bgpM2PeerConfiguration
        OBJECT IDENTIFIER ::= { bgpM2Peer 8 }


    --
    -- Administering activated peering sessions
    --
```

```
    bgpM2CfgPeerAdminStatusTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2CfgPeerAdminStatusEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table containing rows for administratively starting and
             stopping peering sessions."
        ::= { bgpM2PeerConfiguration 1 }


    bgpM2CfgPeerAdminStatusEntry OBJECT-TYPE
        SYNTAX     BgpM2CfgPeerAdminStatusEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing row for administratively starting and
             stopping peers."
        INDEX {
            bgpM2PeerIndex
        }
        ::= { bgpM2CfgPeerAdminStatusTable 1 }


    BgpM2CfgPeerAdminStatusEntry ::= SEQUENCE {
        bgpM2CfgPeerAdminStatus
            INTEGER
    }


    bgpM2CfgPeerAdminStatus OBJECT-TYPE
        SYNTAX      INTEGER {
            stop(1),
            start(2)
        }
        MAX-ACCESS read-write
        STATUS  current
        DESCRIPTION
            "This object allows the Manual Stop and Manual Start
             events to be sent to an activated peering session."
        ::= { bgpM2CfgPeerAdminStatusEntry 1 }


    --
    -- Peer Configuration
    --

    bgpM2CfgPeerNextIndex OBJECT-TYPE
        SYNTAX     Integer32 (0..65535)
```

```
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object contains the next appropriate value to
             use as an index for creation of a row instance in
             in the bgpM2CfgPeerTable.  If the number of available
             entries in the bgpM2CfgPeerTable is exhausted, a
             retrieval value of this object instance will return
             0.  A value of 0 may also be returned if the agent
             is otherwise incapable of bgpM2CfgPeerTable row creation
             at the time of bgpM2CfgPeerNextIndex retrieval."
        ::= { bgpM2PeerConfiguration 2 }


    bgpM2CfgPeerTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2CfgPeerEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "BGP configuration peer table.

             This table allows the configuration of the parameters
             for a session with a BGP peer.

             +++wayne provide description of how config should be done
             for a peer per table."
        ::= { bgpM2PeerConfiguration 3 }


    bgpM2CfgPeerEntry OBJECT-TYPE
        SYNTAX     BgpM2CfgPeerEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing information set up by a management
             entity to configure a connection with a BGP peer."
        INDEX { bgpM2CfgPeerIndex }
        ::= { bgpM2CfgPeerTable 1 }


    BgpM2CfgPeerEntry ::= SEQUENCE {
        bgpM2CfgPeerConfiguredVersion
            Unsigned32,
        bgpM2CfgAllowVersionNegotiation
            TruthValue,
        bgpM2CfgPeerLocalAddrType
            InetAddressType,
        bgpM2CfgPeerLocalAddr
```

```
            InetAddress,
        bgpM2CfgPeerLocalAs
            InetAutonomousSystemNumber,
        bgpM2CfgPeerRemoteAddrType
            InetAddressType,
        bgpM2CfgPeerRemoteAddr
            InetAddress,
        bgpM2CfgPeerRemotePort
            Integer32,
        bgpM2CfgPeerRemoteAs
            InetAutonomousSystemNumber,
        bgpM2CfgPeerEntryStorageType
            StorageType,
        bgpM2CfgPeerError
            INTEGER,
        bgpM2CfgPeerBgpPeerEntry
            RowPointer,
        bgpM2CfgPeerRowEntryStatus
            RowStatus,
        bgpM2CfgPeerIndex
            Integer32,
        bgpM2CfgPeerStatus
            INTEGER
        }


    bgpM2CfgPeerConfiguredVersion OBJECT-TYPE
        SYNTAX     Unsigned32 (1..255)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The configured version to originally start with
             this peer.  The BGP speaker may permit negotiation
             to a lower version number of the protocol depending on the
             set value of bgpM2CfgAllowVersionNegotiation."
        DEFVAL     { 4 }
        ::= { bgpM2CfgPeerEntry 1 }


    bgpM2CfgAllowVersionNegotiation OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "If set to true, during session establishment with this
             peer, negotiation to a version lower than that specified
             in bgpM2CfgPeerConfiguredVersion will be allowed."
        DEFVAL { false }
```

```
        ::= { bgpM2CfgPeerEntry 2 }


    bgpM2CfgPeerLocalAddrType OBJECT-TYPE
        SYNTAX     InetAddressType
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The address family of the speakers of this BGP
             session."
        ::= { bgpM2CfgPeerEntry 3 }


    bgpM2CfgPeerLocalAddr OBJECT-TYPE
        SYNTAX     InetAddress (SIZE (4..20))
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The address of the local end of the peering session."
        ::= { bgpM2CfgPeerEntry 4 }


    bgpM2CfgPeerLocalAs OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Autonomous system represented to peer on peering
             session initialization.  Some implementations of
             BGP can represent themselves as multiple ASes.
             These implementations can set this to an alternate
             autonomous system.  If this object is set to zero
             (0) at the point this row instance is set to active,
             then the implementation will initialize this session
             representing itself as the value of bgpM2CfgLocalAs."
        DEFVAL { 0 }
        ::= { bgpM2CfgPeerEntry 5 }


    bgpM2CfgPeerRemoteAddrType OBJECT-TYPE
        SYNTAX     InetAddressType
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The address family of the speakers of the remote BGP
             session."
        ::= { bgpM2CfgPeerEntry 6 }
```

```
    bgpM2CfgPeerRemoteAddr OBJECT-TYPE
        SYNTAX      InetAddress (SIZE(4..20))
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The address of the remote end (destination address
             of peer) for peering session."
        ::= { bgpM2CfgPeerEntry 7 }


    -- JMH - this isn't compatible with InetPortNumber
    bgpM2CfgPeerRemotePort  OBJECT-TYPE
        SYNTAX      Integer32 (-1 | 0..65535)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "This is the remote port for the transport connection
             between the BGP peers.  In the case of a transport for
             which the notion of port is irrelevant, the value of
             -1 can be defaulted or set."
        DEFVAL { -1 }
        ::= { bgpM2CfgPeerEntry 8 }


    bgpM2CfgPeerRemoteAs OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Autonomous system number of the remote peer."
        ::= { bgpM2CfgPeerEntry 9 }


    bgpM2CfgPeerEntryStorageType OBJECT-TYPE
        SYNTAX     StorageType
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object type specifies the intended storage
             type for the bgpM2CfgPeerEntry row instance."
        ::= { bgpM2CfgPeerEntry 10 }


    -- JMH - Can we mix caps the enumerations?
    bgpM2CfgPeerError  OBJECT-TYPE
        SYNTAX      INTEGER {
            unknown(0),
            notactivated (1),
```

```
            errduplicatepeeringsession (2),
            activated (3)
            -- +++wayne more to follow
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This value indicates the current error status of
             the row denoting the configured error status.

             If this row is still under creation (has not been activated
             bgpM2CfgPeerRowEntryStatus), then this instance will be set to
             not-activated (1).

             At the point that the row is activated, bgpM2CfgPeerError
             will reflect the error status of the row data itself.  If
             there is another session already activated with the same
             local and remote addresses as denoted by
             {bgpM2CfgPeerLocalAddrType, bgpM2CfgPeerLocalAddr,
             bgpM2CfgPeerRemoteAddr, bgpM2CfgPeerRemotePort}, then
             the value of this will be set to
             err-duplicate-peering-session (2).

             If this row is associated with a peer session whose
             initialization has been attempted, the value will be
             set to activated (3) (and, bgpM2PeerCfgPeerEntry will
             be set to the row instance of the entry in the
             bgpM2PeerTable which reflects the state of the peering
             session).

             Note that this object only reflects the error as a
             function of the attempted activation of this row as
             containing data for a bgp peering session.  The actual
             state of the session at the point of any protocol exchange
             or session state machine initiation is reflected in the
             bgpM2PeerTable row instance (as reflected through
             bgpM2CfgPeerPeerEntry) associated with this row instance."
        ::= { bgpM2CfgPeerEntry 11 }


    bgpM2CfgPeerBgpPeerEntry OBJECT-TYPE
        SYNTAX      RowPointer
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Upon activation of the session data contained in this
             row instance, this object points to an instance of a row
             within the bgpM2PeerTable reflecting the session in its
```

```
            initializing or operational state.  Retrieval of this
            column instance will always yield a value of {0.0} unless
            the session has successfully been activated (via
            bgpM2CfgPeerRowEntryStatus).  Such row instances will always
            have a value of bgpM2CfgPeerError which is activated (3)."
        ::= { bgpM2CfgPeerEntry 12 }


    bgpM2CfgPeerRowEntryStatus  OBJECT-TYPE
        SYNTAX     RowStatus
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This object type is used to control creation,
             activation, and deletion of this row instance."
            -- +++wayne need better directions for agent auto-removal
            -- of row instances which have moved to active or error
            -- state
        ::= { bgpM2CfgPeerEntry 13 }


    bgpM2CfgPeerIndex OBJECT-TYPE
        SYNTAX     Integer32 (1..65535)
        MAX-ACCESS accessible-for-notify
        STATUS     current
        DESCRIPTION
            "Uniquely identifies an instance of a peer row, as
             an element of configuration."
        ::= { bgpM2CfgPeerEntry 14 }


    bgpM2CfgPeerStatus OBJECT-TYPE
        SYNTAX      INTEGER {
            halted(1),
            running(2)
        }
        MAX-ACCESS read-create
        STATUS  current
        DESCRIPTION
             "This specifies the state of the peering session upon
              activation.  If disabled, the FSM is in the halted
              state and no Automatic Start events are generated.
              If enabled, the FSM is in the running state and
              Automatic Start events may be generated."
        ::= { bgpM2CfgPeerEntry 15 }


    --
```

```
    -- Per-peer authentication table.
    --

    bgpM2CfgPeerAuthTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2CfgPeerAuthEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table contain per peer configuration for BGP Authentication."
        ::= { bgpM2PeerConfiguration 4 }


    bgpM2CfgPeerAuthEntry OBJECT-TYPE
        SYNTAX     BgpM2CfgPeerAuthEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing information about a peer's BGP Authentication
             configuration."
        AUGMENTS {
            bgpM2CfgPeerEntry
        }
        ::= { bgpM2CfgPeerAuthTable 1 }


    BgpM2CfgPeerAuthEntry ::= SEQUENCE {
        bgpM2CfgPeerAuthEnabled
            TruthValue,
        bgpM2CfgPeerAuthCode
            Unsigned32,
        bgpM2CfgPeerAuthValue
            OCTET STRING
    }


    bgpM2CfgPeerAuthEnabled OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "This value is true if BGP Authentication is enabled for
             this peer.  This is the authentication mechanism
             documented in the base BGP specification, not the MD5
             session protection mechanism."
        DEFVAL {
            false
        }
        ::= { bgpM2CfgPeerAuthEntry 1 }
```

```
    bgpM2CfgPeerAuthCode OBJECT-TYPE
        SYNTAX     Unsigned32(0..255)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The authentication code for the BGP Authentication
             mechanism."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 4.1.a"
        ::= { bgpM2CfgPeerAuthEntry 2 }


    bgpM2CfgPeerAuthValue OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE(0..252))
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "The authentication payload for the BGP authentication
             mechanism.  This value has semantic meaning within
             the context of the authentication code."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 4.1.a"
        ::= { bgpM2CfgPeerAuthEntry 3 }


    --
    -- Per-peer timers table
    --

    bgpM2CfgPeerTimersTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2CfgPeerTimersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table for configuration of per-peer timers."
        ::= {  bgpM2PeerConfiguration 5 }


    bgpM2CfgPeerTimersEntry OBJECT-TYPE
        SYNTAX      BgpM2CfgPeerTimersEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing per-peer timer configuration."
        AUGMENTS {
            bgpM2CfgPeerEntry
        }
        ::= { bgpM2CfgPeerTimersTable 1 }
```

```
    BgpM2CfgPeerTimersEntry ::= SEQUENCE {
        bgpM2CfgPeerConnectRetryInterval
            Unsigned32,
        bgpM2CfgPeerHoldTimeConfigured
            Unsigned32,
        bgpM2CfgPeerKeepAliveConfigured
            Unsigned32,
        bgpM2CfgPeerMinASOrigInterval
            Unsigned32,
        bgpM2CfgPeerMinRouteAdverInter
            Unsigned32
    }


    bgpM2CfgPeerConnectRetryInterval OBJECT-TYPE
        SYNTAX     Unsigned32 (1..65535)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the ConnectRetry
             timer.  The suggested value for this timer is 120
             seconds."
        DEFVAL {
            120
        }
        ::= { bgpM2CfgPeerTimersEntry 1 }


    bgpM2CfgPeerHoldTimeConfigured OBJECT-TYPE
        SYNTAX     Unsigned32 ( 0 | 3..65535 )
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the Hold Time configured
             for this BGP speaker with this peer.  This value
             is placed in an OPEN message sent to this peer by
             this BGP speaker, and is compared with the Hold
             Time field in an OPEN message received from the
             peer when determining the Hold Time (bgpM2PeerHoldTime)
             with the peer.  This value must not be less than
             three seconds if it is not zero (0) in which case
             the Hold Time is NOT to be established with the
             peer.  The suggested value for this timer is 90
             seconds."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Appendix 6.4"
        DEFVAL {
            90
```

```
        }
        ::= { bgpM2CfgPeerTimersEntry 2 }


    bgpM2CfgPeerKeepAliveConfigured OBJECT-TYPE
        SYNTAX     Unsigned32 ( 0 | 1..21845 )
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the KeepAlive timer
             configured for this BGP speaker with this peer.
             The value of this object will only determine the
             KEEPALIVE messages frequency relative to the value
             specified in bgpM2PeerHoldTimeConfigured; the actual
             time interval for the KEEPALIVE messages is indicated
             by bgpM2PeerKeepAlive.  A reasonable maximum value
             for this timer would be configured to be one third
             of that of bgpM2PeerHoldTimeConfigured.

             If the value of this object is zero (0), no
             periodical KEEPALIVE messages are sent to the peer
             after the BGP connection has been established.
             The suggested value for this timer is 30 seconds."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Appendix 6.4"
        DEFVAL {
            30
        }
        ::= { bgpM2CfgPeerTimersEntry 3 }


    bgpM2CfgPeerMinASOrigInterval OBJECT-TYPE
        SYNTAX     Unsigned32 (0..65535)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the MinASOriginationInterval
             timer.  The suggested value for this timer is 15
             seconds."
        DEFVAL {
            15
        }
        ::= { bgpM2CfgPeerTimersEntry 4 }


    bgpM2CfgPeerMinRouteAdverInter OBJECT-TYPE
        SYNTAX     Unsigned32 (0..65535)
        MAX-ACCESS read-create
```

```
        STATUS     current
        DESCRIPTION
            "Time interval in seconds for the
             MinRouteAdvertisementInterval timer.  The suggested
             value for this timer is 30 seconds."
        DEFVAL {
            30
        }
        ::= { bgpM2CfgPeerTimersEntry 5 }


    --
    -- Per-peer configuration extensions
    --

    bgpM2CfgPeerExtensions
        OBJECT IDENTIFIER ::= { bgpM2PeerConfiguration 6 }


    bgpM2CfgPeerNonCapExts
        OBJECT IDENTIFIER ::= { bgpM2CfgPeerExtensions 1 }


    bgpM2CfgPeerCapExts
        OBJECT IDENTIFIER ::= { bgpM2CfgPeerExtensions 2 }


    --
    -- Peer route reflection configuration
    --

    bgpM2CfgPeerRouteReflectionExts
        OBJECT IDENTIFIER ::= { bgpM2CfgPeerNonCapExts 2796 }


    bgpM2CfgPeerReflectorClientTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2CfgPeerReflectorClientEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table of route reflection client settings on a per-peer
             basis."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2CfgPeerRouteReflectionExts 1 }


    bgpM2CfgPeerReflectorClientEntry OBJECT-TYPE
```

```
        SYNTAX     BgpM2CfgPeerReflectorClientEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing data on a per-peer basis on whether
             the peer is configured as a route reflector client."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        AUGMENTS {
            bgpM2CfgPeerEntry
        }
        ::= { bgpM2CfgPeerReflectorClientTable 1 }


    BgpM2CfgPeerReflectorClientEntry ::= SEQUENCE {
        bgpM2CfgPeerReflectorClient
            INTEGER
    }

    bgpM2CfgPeerReflectorClient OBJECT-TYPE
        SYNTAX    INTEGER {
            nonClient(0),
            client(1),
            meshedClient(2)
        }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "This value indicates whether the given peer is a
             reflector client of this router, or not.  A value of
             nonClient indicates that this peer is not a reflector
             client.  A value of client indicates that this peer is a
             reflector client that is not fully meshed with other
             reflector clients.  A value of meshedClient indicates
             that the peer is a reflector client and is fully meshed
             with all other reflector clients.

             This value must be nonClient (0) for BGP external peers."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2CfgPeerReflectorClientEntry 1 }


    --
    -- Peer AS Confederations Extensions
    --

    bgpM2CfgPeerASConfederationExts
```

```
        OBJECT IDENTIFIER ::= { bgpM2CfgPeerNonCapExts 3065 }


    bgpM2CfgPeerConfedMemberTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2CfgPeerConfedMemberEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Table of confederation member settings on a per-peer
             basis."
        REFERENCE
            "RFC 3065 - BGP Confederations"
        ::= { bgpM2CfgPeerASConfederationExts 1 }


    bgpM2CfgPeerConfedMemberEntry OBJECT-TYPE
        SYNTAX     BgpM2CfgPeerConfedMemberEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Entry containing data on a per-peer basis on whether
             the peer is configured as a BGP confederation member."
        REFERENCE
            "RFC 3065 - BGP Confederations"
        AUGMENTS {
            bgpM2PeerEntry
        }
        ::= { bgpM2CfgPeerConfedMemberTable 1 }


    BgpM2CfgPeerConfedMemberEntry ::= SEQUENCE {
        bgpM2CfgPeerConfedMember
            TruthValue
    }


    bgpM2CfgPeerConfedMember OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "This value indicates whether the given peer is in our
             confederation or not."
        REFERENCE
            "RFC 3065 - BGP Confederations"
        ::= { bgpM2CfgPeerConfedMemberEntry 1 }
```

```
    --
    -- BGP NLRI Data
    --

    bgpM2Rib
        OBJECT IDENTIFIER ::= { bgp 3 }


    --
    -- NLRI Table
    --

    bgpM2NlriTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2NlriEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BGP-4 Received Path Attribute Table contains
             information about paths to destination networks
             received from all BGP4 peers.  Collectively, this
             represents the Adj-Ribs-In.  The route where
             bgpM2NlriBest is TRUE represents, for this NLRI,
             the route that is installed in the LocRib from the
             Adj-Ribs-In."
        ::= { bgpM2Rib 1 }


    bgpM2NlriEntry OBJECT-TYPE
        SYNTAX     BgpM2NlriEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Information about a path to a network."
        INDEX {
            bgpM2PeerIndex,
            bgpM2NlriAfi,
            bgpM2NlriSafi,
            bgpM2NlriPrefixLen,
            bgpM2NlriPrefix,
            bgpM2NlriIndex
        }
        ::= { bgpM2NlriTable 1 }


    BgpM2NlriEntry ::= SEQUENCE {
        bgpM2NlriIndex
            Unsigned32,
        bgpM2NlriAfi
```

```
            InetAddressType,
        bgpM2NlriSafi
            BgpM2Safi,
        bgpM2NlriPrefixLen
            InetAddressPrefixLength,
        bgpM2NlriPrefix
            InetAddress,
        bgpM2NlriBest
            TruthValue,
        bgpM2NlriCalcLocalPref
            Unsigned32,
        bgpM2PathAttrIndex
            Unsigned32,
        bgpM2NlriOpaqueType
            INTEGER,
        bgpM2NlriOpaquePointer
            RowPointer
    }


    bgpM2NlriIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This index allows for multiple instances of a base
             prefix for a certain AFI SAFI from a given peer.
             This is currently useful for two things:
             1. Allowing for a peer in future implementations to
                send more than a single route instance.
             2. Allow for extensions which extend the NLRI field
                to send the same prefix while utilizing other
                extension specific information.  An example of
                this is RFC 3107 - Carrying MPLS labels in BGP."
        REFERENCE
            "RFC 3107 - Carrying Label Information in BGP-4"
        ::= { bgpM2NlriEntry 1 }


    bgpM2NlriAfi OBJECT-TYPE
        SYNTAX     InetAddressType
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The address family of the prefix for this NLRI."
        ::= { bgpM2NlriEntry 2 }
```

```
    bgpM2NlriSafi OBJECT-TYPE
        SYNTAX     BgpM2Safi
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The subsequent address family of the prefix for
             this NLRI"
        REFERENCE
            "RFC 2858 - Multiprotocol Extensions for BGP-4"
        ::= { bgpM2NlriEntry 3 }


    bgpM2NlriPrefixLen OBJECT-TYPE
        SYNTAX     InetAddressPrefixLength
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Length in bits of the address prefix in
             the Network Layer Reachability Information field."
        ::= { bgpM2NlriEntry 4 }


    bgpM2NlriPrefix OBJECT-TYPE
        SYNTAX     InetAddress  (SIZE (4..20))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An IP address prefix in the Network Layer
             Reachability Information field.  This object
             is an IP address containing the prefix with
             length specified by
             bgpM2PathAttrAddrPrefixLen.
             Any bits beyond the length specified by
             bgpM2PathAttrAddrPrefixLen are zeroed."
        ::= { bgpM2NlriEntry 5 }


    bgpM2NlriBest OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An indication of whether or not this route
             was chosen as the best BGP4 route."
        ::= { bgpM2NlriEntry 6 }


    bgpM2NlriCalcLocalPref OBJECT-TYPE
```

```
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The degree of preference calculated by the
             receiving BGP4 speaker for an advertised
             route."
        ::= { bgpM2NlriEntry 7 }


    bgpM2PathAttrIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is a unique index for the per-NLRI entry
             in the bgpM2PeerAttrTable.  It is assigned by the
             agent at the point of creation of the bgpM2PeerAttrTable
             row entry.  While its value is guaranteed to be unique
             at any time, it is otherwise opaque to the management
             application with respect to its value or the contiguity
             of bgpM2PeerAttrIndex row instance values across rows
             of the bgpM2PeerAttrTable.  It is used to provide an
             index structure for other tables whose data is logically
             per-peer, per-NLRI."
        ::= { bgpM2NlriEntry 8 }


    bgpM2NlriOpaqueType OBJECT-TYPE
        SYNTAX     INTEGER {
            none(0),
            bgpMplsLabelStack(1)
        }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object enumerates the type of the row that is
             pointed to in the table row bgpM2NlriOpaquePointer
             instance, if bgpM2NlriOpaquePointer is in fact not
             a zero length.  bgpM2NlriOpaqueType is necessary since
             the data referenced by bgpM2NlriOpaquePointer is
             opaque to BGP.  For example, in the case of RFC 3107,
             the label stack that is pointed to may occur in the
             mplsLabelStackTable from the MPLS-LSR-MIB, and the
             instance value of bgpM2NlriOpaqueType would be
             bgpMplsLabelStack(1)."
        REFERENCE
            "RFC 3107 - Carrying Label Information in BGP-4
```

```
            draft-ietf-mpls-lsr-mib-08.txt"
        ::= { bgpM2NlriEntry 9 }


    bgpM2NlriOpaquePointer OBJECT-TYPE
        SYNTAX     RowPointer
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Pointer to a row that decomposes the data that is
             opaque to the BGP MIB but is sent in the NLRI.
             This RowPointer has zero (0) length data instance
             if bgpM2NlriOpaqueType is none."
        ::= { bgpM2NlriEntry 10 }


    --
    -- Adj-Ribs-Out Table
    --

    bgpM2AdjRibsOutTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2AdjRibsOutEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "This table contains on a per-peer basis one or more
             routes from the bgpM2NlriTable that have been
             placed in this peer's Adj-Ribs-Out."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 3.2"
        ::= { bgpM2Rib 2 }


    bgpM2AdjRibsOutEntry OBJECT-TYPE
        SYNTAX     BgpM2AdjRibsOutEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "List of BGP routes that have been placed into a
             peer's Adj-Ribs-Out."
        INDEX {
            bgpM2PeerIndex,
            bgpM2NlriAfi,
            bgpM2NlriSafi,
            bgpM2NlriPrefixLen,
            bgpM2NlriPrefix,
            bgpM2AdjRibsOutIndex
        }
```

```
        ::= { bgpM2AdjRibsOutTable 1 }


    BgpM2AdjRibsOutEntry ::= SEQUENCE {
        bgpM2AdjRibsOutIndex
            Unsigned32,
        bgpM2AdjRibsOutRoute
            RowPointer
    }


    bgpM2AdjRibsOutIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Certain extensions to BGP permit multiple instance of
             a per afi, per safi prefix to be advertised to a peer.
             This object allows the enumeration of them."
        ::= { bgpM2AdjRibsOutEntry 1 }


    bgpM2AdjRibsOutRoute OBJECT-TYPE
        SYNTAX     RowPointer
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This object points to the route in the bgpM2NlriTable
             that corresponds to the entry in the peer's
             Adj-Rib-Out.  Outgoing route maps are not
             reflected at this point as those are part of the
             Update-Send process."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 9.2"
        ::= { bgpM2AdjRibsOutEntry 2 }


    --
    -- BGP Rib Path Attributes Table
    --

    --
    -- Path Attribute Counter
    --

    bgpM2PathAttrCount OBJECT-TYPE
        SYNTAX     Counter32
        MAX-ACCESS read-only
```

```
        STATUS     current
        DESCRIPTION
            "The number of entries in the bgpM2PathAttrTable."
        ::= { bgpM2Rib 3 }


    --
    -- Path Attributes Table
    --

    bgpM2PathAttrTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PathAttrEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Provides per advertised network-prefix attribute data,
             as advertised over a peering session."
        ::= { bgpM2Rib 4 }


    bgpM2PathAttrEntry OBJECT-TYPE
        SYNTAX     BgpM2PathAttrEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each entry contains data about a given network
             prefix, per-prefix and per-advertising peer."
        INDEX {
            bgpM2PathAttrIndex
        }
        ::= { bgpM2PathAttrTable 1 }


    BgpM2PathAttrEntry ::= SEQUENCE {
        bgpM2PathAttrOrigin
            INTEGER,
        bgpM2PathAttrNextHopAddrType
            InetAddressType,
        bgpM2PathAttrNextHop
            InetAddress,
        bgpM2PathAttrMedPresent
            TruthValue,
        bgpM2PathAttrMed
            Unsigned32,
        bgpM2PathAttrLocalPrefPresent
            TruthValue,
        bgpM2PathAttrLocalPref
            Unsigned32,
```

```
        bgpM2PathAttrAtomicAggregate
            INTEGER,
        bgpM2PathAttrAggregatorAS
            InetAutonomousSystemNumber,
        bgpM2PathAttrAggregatorAddr
            BgpM2Identifier,
        bgpM2AsPathCalcLength
            Unsigned32,
        bgpM2AsPathString
            DisplayString,
        bgpM2AsPathIndex
            Unsigned32
    }


    bgpM2PathAttrOrigin OBJECT-TYPE
        SYNTAX     INTEGER {
            igp(1),-- networks are interior
            egp(2),-- networks learned via the EGP protocol
            incomplete(3) -- undetermined
            }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The ultimate origin of the path information."
        ::= { bgpM2PathAttrEntry 1 }


    bgpM2PathAttrNextHopAddrType OBJECT-TYPE
        SYNTAX      InetAddressType
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The address family of the address for
             the border router that should be used
             to access the destination network."
        ::= { bgpM2PathAttrEntry 2 }


    -- JMH - this is wrong for RFC2545!
    -- We need to extend InetAddressType so we have a valid InetAddress
    -- for this.
    bgpM2PathAttrNextHop OBJECT-TYPE
        SYNTAX     InetAddress (SIZE(4..20))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The address of the border router that
```

```
            should be used to access the destination
            network.  This address is the nexthop
            address received in the UPDATE packet.
            The address family of this object will be the
            same as that of the prefix in this row."
        ::= { bgpM2PathAttrEntry 3 }


    bgpM2PathAttrMedPresent OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Whether or not the MED value is present.
             If it is not present, the bgpM2PathAttrMed
             object has no useful value and should be set to 0."
        ::= { bgpM2PathAttrEntry 4 }


    bgpM2PathAttrMed OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This metric is used to discriminate
             between multiple exit points to an
             adjacent autonomous system."
        ::= { bgpM2PathAttrEntry 5 }


    bgpM2PathAttrLocalPrefPresent OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Whether or not the LocalPref value is present.
             If it is not present, the bgpM2PathAttrLocalPref
             object has no useful value and should be set to 0."
        ::= { bgpM2PathAttrEntry 6 }


    bgpM2PathAttrLocalPref OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The originating BGP4 speakers degree of
             preference for an advertised route."
```

```
        ::= { bgpM2PathAttrEntry 7 }


-- JMH
-- See comment in v1 draft about this.

    bgpM2PathAttrAtomicAggregate OBJECT-TYPE
        SYNTAX     INTEGER {
            lessSpecificRouteNotSelected(1),
            lessSpecificRouteSelected(2)
            }
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Whether or not a system has selected
             a less specific route without
             selecting a more specific route."
        ::= { bgpM2PathAttrEntry 8 }


    bgpM2PathAttrAggregatorAS OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The AS number of the last BGP4 speaker that
             performed route aggregation.  A value of
             zero (0) indicates the absence of this
             attribute.

             Note propagation of AS of zero is illegal in
             the Internet."
        ::= { bgpM2PathAttrEntry 9 }


    bgpM2PathAttrAggregatorAddr OBJECT-TYPE
        SYNTAX     BgpM2Identifier
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The IP address of the last BGP4 speaker
             that performed route aggregation.  A
             value of 0.0.0.0 indicates the absence
             of this attribute."
        ::= { bgpM2PathAttrEntry 10 }


    bgpM2AsPathCalcLength OBJECT-TYPE
```

```
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the calculated length of the
             AS Path according to the rules of the BGP specification.
             This value is used in route selection."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 9.1.2.2.a"
        ::= { bgpM2PathAttrEntry 11 }


    bgpM2AsPathString OBJECT-TYPE
        SYNTAX     DisplayString
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This is a string depicting the autonomous system
             path to this network which was received from the
             peer which advertised it.  The format of the string
             is implementation-dependent, and should be designed
             for operator readability."
        ::= { bgpM2PathAttrEntry 12 }


    bgpM2AsPathIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is a unique index for the decomposed AS Path
             in the bgpM2AsPathTable.  It is assigned by the
             agent at the point of creation of the bgpM2AsPathTable
             row entry.  While its value is guaranteed to be unique
             at any time, it is otherwise opaque to the management
             application with respect to its value or the contiguity
             of bgpM2AsPathIndex row instance values across rows
             of the bgpM2AsPathTable."
        ::= { bgpM2PathAttrEntry 13 }


    --
    -- As-4 byte AS_PATH
    --

    bgpM2AsPath4byteTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2AsPath4byteEntry
        MAX-ACCESS not-accessible
```

```
        STATUS     current
        DESCRIPTION
            "This table is present for BGP speakers that support
             the AS 4byte specification and are functioning as
             a router between 2-byte and 4-byte AS space."
        REFERENCE
            "draft-ietf-idr-as4bytes-04.txt - BGP support for
             four-octet AS number space"
        ::= { bgpM2Rib 5 }


    bgpM2AsPath4byteEntry OBJECT-TYPE
        SYNTAX     BgpM2AsPath4byteEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Each row contains the information for the AS 4-byte
             extension's NEW_AS_PATH and NEW_AGGREGATOR attributes."
        AUGMENTS {
            bgpM2PathAttrEntry
        }
        ::= { bgpM2AsPath4byteTable 1 }


    BgpM2AsPath4byteEntry ::= SEQUENCE {
        bgpM2AsPath4bytePathPresent
            TruthValue,
        bgpM2AsPath4byteAggregatorAS
            InetAutonomousSystemNumber,
        bgpM2AsPath4byteCalcLength
            Unsigned32,
        bgpM2AsPath4byteString
            DisplayString,
        bgpM2AsPath4byteIndex
            Unsigned32
    }


    bgpM2AsPath4bytePathPresent OBJECT-TYPE
        SYNTAX     TruthValue
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value may only be true if this BGP Speaker
             is functioning as a router between ASs that
             are in 2-byte and 4-byte AS space.  If this
             value is true, then the NEW_AS_PATH attributes
             are present and the 4-byte versions of the
```

```
            appropriate path attributes are in this row.

            If this value is false, then the following values
            will be present in the row:

            bgpM2PathAttrAggregatorAS - zero (0).
            bgpM2AsPathCalcLength - zero (0).
            bgpM2AsPathString - zero (0) length string.
            bgpM2AsPathIndex - zero (0)."
        ::= { bgpM2AsPath4byteEntry 1 }


    bgpM2AsPath4byteAggregatorAS OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The NEW_AGGREGATOR AS number of the last BGP4 speaker
             that performed route aggregation.  A value of
             zero (0) indicates the absence of this
             attribute.

             Note propagation of AS of zero is illegal in
             the Internet."
        ::= { bgpM2AsPath4byteEntry 2 }


    bgpM2AsPath4byteCalcLength OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value represents the calculated length of the
             NEW_AS_PATH according to the rules of the BGP specification.
             This value is used in route selection."
        REFERENCE
            "draft-ietf-idr-bgp4-17.txt, Sec. 9.1.2.2.a"
        ::= { bgpM2AsPath4byteEntry 3 }


    bgpM2AsPath4byteString OBJECT-TYPE
        SYNTAX     DisplayString
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This is a string depicting the autonomous system
             path to this network which was received from the
             peer which advertised it.  The format of the string
```

```
             is implementation-dependent, and should be designed
             for operator readability."
        ::= { bgpM2AsPath4byteEntry 4 }


    bgpM2AsPath4byteIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "This value is a unique index for the decomposed AS Path
             in the bgpM2AsPathTable.  It is assigned by the
             agent at the point of creation of the bgpM2AsPathTable
             row entry.  While its value is guaranteed to be unique
             at any time, it is otherwise opaque to the management
             application with respect to its value or the contiguity
             of bgpM2AsPathIndex row instance values across rows
             of the bgpM2AsPathTable. "
        ::= { bgpM2AsPath4byteEntry 5 }


    --    BGP 4 Path attribute AS Path Table.  There is one row in
    --    this table for each AS which is advertised for a given
    --    route as provided from a peer.

-- JMH
-- We need one of these for the NewAsPath for the 4byte draft

    bgpM2AsPathTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2AsPathEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BGP-4 Path Attribute AS Path Table
             contains the per network path (NLRI)
             AS PATH data received from the
             advertising BGP peer."
        ::= { bgpM2Rib 6 }


    bgpM2AsPathTableEntry OBJECT-TYPE
        SYNTAX     BgpM2AsPathEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Information about an AS path provided with a path to
             a network."
        INDEX {
```

```
            bgpM2PathAttrIndex,
            bgpM2AsPathSegmentIndex,
            bgpM2AsPathElementIndex,
            bgpM2AsPathElementValue
        }
        ::= { bgpM2AsPathTable 1 }


    BgpM2AsPathEntry ::= SEQUENCE {
        bgpM2AsPathSegmentIndex
            Unsigned32,
        bgpM2AsPathElementIndex
            Unsigned32,
        bgpM2AsPathType
            INTEGER,
        bgpM2AsPathElementValue
            InetAutonomousSystemNumber
    }


    bgpM2AsPathSegmentIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "A per-AS path segment index.  This will index a set of
             autonomous systems in an AS path which are part
             of the same sequence or set (as determined by
             the row value of bgpM2AsPathType, which
             should be the same value for each bgpM2AsPathTable
             entry indexed by the same (bgpM2PathAttrIndex,
             bgpM2AsPathIndex) pair)."
        ::= { bgpM2AsPathTableEntry 1 }


    bgpM2AsPathElementIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "A per-AS element index.  This will index a particular
             AS within a sequence or set of autonomous systems in
             an AS path."
        ::= { bgpM2AsPathTableEntry 2 }


    bgpM2AsPathType OBJECT-TYPE
        SYNTAX  INTEGER {
```

```
            asSet(1),
            asSequence(2),
            confedSequence(3),
            confedSet(4)
         }
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
             "The type of sequence in which this asPath
              was advertised as an attribute.  Note that
              all asPath row instances for a given (bgpM2PathAttrIndex,
              bgpM2AsPathIndex) index pair will have their
              bgpM2AsPathType set to the same value.
              The values for bgpM2AsPathType are
              interpreted as defined in the base BGP document
              and the BGP AS Confederations document."
        REFERENCE
             "draft-ietf-idr-bgp4-16
              RFC 3065 - BGP AS Confederations"
        ::= { bgpM2AsPathTableEntry 3 }


    bgpM2AsPathElementValue OBJECT-TYPE
        SYNTAX     InetAutonomousSystemNumber
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An AS value for an AS the related NLRI traversed
             in the propagation of its advertisement.  This
             value is to be interpreted in the context of the
             sequence implied by bgpM2AsPathIndex and
             bgpM2AsPathType (and, in sequence of the
             other table rows with the same value of
             bgpM2PathAttrIndex and bgpM2AsPathIndex)."
        ::= { bgpM2AsPathTableEntry 4 }


    --    BGP 4 Path unknown attribute.  There is one row in
    --    this table for each attribute not known by this BGP
    --    implementation (or agent instrumentation), but provided
    --    from a peer.

    bgpM2PathAttrUnknownTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PathAttrUnknownEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BGP-4 Path Attribute Unknown Table
```

```
            contains the per network path (NLRI)
            data on the path attributes advertised
            with a route but not known to the local BGP implementation
            or not otherwise capable of being returned from this agent.

            The absence of row data for a given index value for
            bgpM2PathAttrIndex indicates a lack of such unknown
            attribute information for the indicated network path
            (as indexed by that bgpM2PathAttrIndex value in the
            bgpM2PathAttrTable)."
        ::= { bgpM2Rib 7 }


    bgpM2PathAttrUnknownEntry OBJECT-TYPE
        SYNTAX     BgpM2PathAttrUnknownEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Information about an unknown attribute
             provided with a path to a network."
        INDEX {
            bgpM2PathAttrIndex,
            bgpM2PathAttrUnknownIndex
        }
        ::= { bgpM2PathAttrUnknownTable 1 }


    BgpM2PathAttrUnknownEntry ::= SEQUENCE {
        bgpM2PathAttrUnknownIndex
            Unsigned32,
        bgpM2PathAttrUnknownType
            Unsigned32,
        bgpM2PathAttrUnknownValue
            OCTET STRING
    }


    bgpM2PathAttrUnknownIndex OBJECT-TYPE
        SYNTAX Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An integer index for a row in this table."
        ::= { bgpM2PathAttrUnknownEntry 1 }


    bgpM2PathAttrUnknownType OBJECT-TYPE
        SYNTAX Unsigned32
```

```
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The attribute type advertised with this unknown
             attribute by the peer."
        ::= { bgpM2PathAttrUnknownEntry 2 }


    -- Maximum size of the following is derived as
    --     4096   max message size
    --    -  16    BGP message marker bytes
    --    -   2    BGP message size
    --    -   1    BGP message type (UPDATE with unknown attr)
    --    -   2    UPDATE routes length (even assuming no routes)
    --    -   2    UPDATE path attributes length
    --    -   1    path attribute flag octet
    --    -   2    unknown path attr type (in bgpM2PathAttrUnknownType)
    --   ---------
    --    4070 bytes maximum per-message attribute value data


    bgpM2PathAttrUnknownValue OBJECT-TYPE
        SYNTAX     OCTET STRING (SIZE(0..4070))
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "Value of path attribute not understood
             by the base BGP-4 document.

             Octets beyond the maximum size, if any,
             are not recorded by this row object. "
        ::= { bgpM2PathAttrUnknownEntry 3 }


    --
    -- Path Attribute Extensions
    --

    bgpM2PathAttrExtensions
        OBJECT IDENTIFIER ::= { bgpM2Rib 8 }


    bgpM2PathAttrNonCapExts
        OBJECT IDENTIFIER ::= { bgpM2PathAttrExtensions 1 }


    bgpM2PathAttrCapExts
        OBJECT IDENTIFIER ::= { bgpM2PathAttrExtensions 2 }
```

```
    --
    -- Path Attribute Route Reflection Extensions
    --

    --
    -- Originator ID Table
    --

    bgpM2PathAttrRouteReflectionExts
        OBJECT IDENTIFIER ::= { bgpM2PathAttrNonCapExts 2796 }


    bgpM2PathAttrOriginatorIdTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF BgpM2PathAttrOriginatorIdEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Per prefix data pertinent to advertisement of a
             network prefix through an originator."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        ::= { bgpM2PathAttrRouteReflectionExts 1 }


    bgpM2PathAttrOriginatorIdEntry OBJECT-TYPE
        SYNTAX      BgpM2PathAttrOriginatorIdEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Each entry contains data pertinent to a network
             prefix as received through its originating BGP
             route reflector."
        REFERENCE
            "RFC 2796 - BGP Route Reflection"
        INDEX {
            bgpM2PathAttrIndex
        }
        ::= { bgpM2PathAttrOriginatorIdTable 1 }


    BgpM2PathAttrOriginatorIdEntry ::= SEQUENCE {
        bgpM2PathAttrOriginatorId
            BgpM2Identifier
    }


    bgpM2PathAttrOriginatorId OBJECT-TYPE
        SYNTAX      BgpM2Identifier
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The Originator-ID identifying the router that initially
             advertised this destination to a Route Reflector.  A
             value of 0.0.0.0 indicates the absence of this attribute."
        REFERENCE
             "This attribute is defined in [RFC2796]."
        ::= { bgpM2PathAttrOriginatorIdEntry 1 }


    --
    -- Cluster table
    --

    bgpM2PathAttrClusterTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PathAttrClusterEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BGP-4 Path Attribute Cluster Table
             contains the per network path (NLRI)
             data on the reflection path which a
             route has traversed.  The absence of row
             data for a given index value for bgpM2PathAttrIndex
             indicates a lack of this attribute information
             for the indicated network path (as indexed by
             that bgpM2PathAttrIndex value in the bgpM2PathAttrTable)."
        ::= { bgpM2PathAttrRouteReflectionExts 2 }


    bgpM2PathAttrClusterEntry OBJECT-TYPE
        SYNTAX     BgpM2PathAttrClusterEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Information about a cluster traversal
             provided with a path to a network."
        INDEX {
            bgpM2PathAttrIndex,
            bgpM2PathAttrClusterIndex
        }
        ::= { bgpM2PathAttrClusterTable 1 }


    BgpM2PathAttrClusterEntry ::= SEQUENCE {
        bgpM2PathAttrClusterIndex
            Unsigned32,
```

```
        bgpM2PathAttrClusterValue
            Unsigned32
    }


    bgpM2PathAttrClusterIndex OBJECT-TYPE
        SYNTAX     Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An integral index for a row in this table."
        ::= { bgpM2PathAttrClusterEntry 1 }


    bgpM2PathAttrClusterValue OBJECT-TYPE
        SYNTAX      BgpM2Identifier
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "A four octet long value representing a part of the
            reflection path that the route has passed.  Each such four
            octet long value represents the ID of a cluster that
            the route has traversed.  The sequence of this path as
            received in the route advertisement will be preserved in
            the sequence of bgpM2PathAttrClusterTable rows (and the
            bgpM2PathAttrClusterValues in each row) as returned for
            a given bgpM2PathAttrIndex value, and the monotonically
            increasing sequence of bgpM2PathAttrClusterIndex values
            for that bgpM2PathAttrIndex."
        REFERENCE
            "This attribute is defined in [RFC2796]."
        ::= { bgpM2PathAttrClusterEntry 2 }


    --
    -- BGP Communities
    --

    bgpM2PathAttrCommunityExts
        OBJECT IDENTIFIER ::= { bgpM2PathAttrNonCapExts 1997 }


    bgpM2PathAttrCommTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PathAttrCommEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BGP-4 Path Attribute Community Table
```

```
            contains the per network path (NLRI)
            data on the community membership advertised
            with a route.  The absence of row
            data for a given index value for bgpM2PathAttrIndex
            indicates a lack of this attribute information
            for the indicated network path (as indexed by
            that bgpM2PathAttrIndex value in the bgpM2PathAttrTable)."
        ::= { bgpM2PathAttrCommunityExts 1 }


    bgpM2PathAttrCommEntry OBJECT-TYPE
        SYNTAX     BgpM2PathAttrCommEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Information about a community association
             provided with a path to a network."
        INDEX {
            bgpM2PathAttrIndex,
            bgpM2PathAttrCommIndex
        }
        ::= { bgpM2PathAttrCommTable 1 }


    BgpM2PathAttrCommEntry ::= SEQUENCE {
        bgpM2PathAttrCommIndex
            Unsigned32,
        bgpM2PathAttrCommValue
            BgpM2Community
    }


    bgpM2PathAttrCommIndex OBJECT-TYPE
        SYNTAX Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An integer index for a row in this table."
        ::= { bgpM2PathAttrCommEntry 1 }


    bgpM2PathAttrCommValue  OBJECT-TYPE
        SYNTAX      BgpM2Community
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "A value representing a community.   There are certain
             4-octet long values which could be returned in this
```

```
            columnar row data that carry additional semantics."
        REFERENCE
            "RFC 1997 - BGP Communities Attribute"
        ::= { bgpM2PathAttrCommEntry 2 }


    --
    -- BGP Extended Communities
    --

    bgpM2PathAttrExtCommTable OBJECT-TYPE
        SYNTAX     SEQUENCE OF BgpM2PathAttrExtCommEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "The BGP-4 Path Attribute Community Table
            contains the per network path (NLRI)
            data on the extended community membership advertised
            with a route.  The absence of row
            data for a given index value for bgpM2PathAttrIndex
            indicates a lack of this attribute information
            for the indicated network path (as indexed by
            that bgpM2PathAttrIndex value in the bgpM2PathAttrTable).

            XXX JMH - can not assign the OID until an RFC is published."
        ::= { bgpM2PathAttrNonCapExts XXX }


    bgpM2PathAttrExtCommEntry OBJECT-TYPE
        SYNTAX     BgpM2PathAttrExtCommEntry
        MAX-ACCESS not-accessible
        STATUS     current
        DESCRIPTION
            "Information about an extended community association
             provided with a path to a network."
        INDEX {
            bgpM2PathAttrIndex,
            bgpM2PathAttrExtCommIndex
        }
        ::= { bgpM2PathAttrExtCommTable 1 }


    BgpM2PathAttrExtCommEntry ::= SEQUENCE {
        bgpM2PathAttrExtCommIndex
            Unsigned32,
        bgpM2PathAttrExtCommValue
            BgpM2ExtendedCommunity
    }
```

```
    bgpM2PathAttrExtCommIndex OBJECT-TYPE
        SYNTAX Unsigned32
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "An integral index for a row in this table."
        ::= { bgpM2PathAttrExtCommEntry 1 }


    bgpM2PathAttrExtCommValue  OBJECT-TYPE
        SYNTAX      BgpM2ExtendedCommunity
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "A value representing an extended community which was
            received with the route implied by the bgpM2PathAttr
            Index value of this row data.   There are certain
            8-octet long values which could be returned in this
            columnar row data that carry additional semantics."
        REFERENCE
            "BGP-EXTCOMM - BGP Extended Communities Attribute"
        ::= { bgpM2PathAttrExtCommEntry 2 }



    --
    -- Conformance Information
    --

    bgpM2Conformance
        OBJECT IDENTIFIER ::= { bgp 4 }


    bgpM2MIBCompliances OBJECT IDENTIFIER ::=
        { bgpM2Conformance 1 }


    bgpM2MIBGroups      OBJECT IDENTIFIER ::=
        { bgpM2Conformance 2 }


    bgpM2MIBCompliance MODULE-COMPLIANCE
        STATUS  current
        DESCRIPTION
            "The compliance statement for entities which
            implement the BGP4 mib."
         MODULE  -- this module
         MANDATORY-GROUPS {
```

```
            bgpM2TimersGroup,
            bgpM2CountersGroup,
            bgpM2AsPathGroup,
            bgpM2As4byteGroup,
            bgpM2BaseGroup,
            bgpM2ErrorsGroup,
            bgpM2PeerGroup,
            bgpM2PathAttributesGroup
            }
        GROUP bgpM2MIBNotificationsGroup
        DESCRIPTION
            "The notifications group is completely optional,
             but highly recommended."
        GROUP bgpM2AuthenticationGroup
        DESCRIPTION
            "The authentication group is
             mandatory only for those implementations which
             support sending and receiving authentication
             information with peers in the BGP Authentication
             Field."
        GROUP bgpM2CommunitiesGroup
        DESCRIPTION
            "The communities group is mandatory only for those
             which support the BGP community attribute."
        GROUP bgpM2ExtCommunitiesGroup
        DESCRIPTION
            "The communities group is mandatory only for those
             which support the BGP extended community attribute."
        GROUP bgpM2RouteReflectionGroup
        DESCRIPTION
            "The communities group is mandatory only for those
             which support the BGP route reflection relationships."
        GROUP bgpM2AsConfederationGroup
        DESCRIPTION
            "The communities group is mandatory only for those
             which support the BGP confederation membership."
        GROUP bgpM2TimersGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2CountersGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2CapabilitiesGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2AsPathGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
```

```
        GROUP bgpM2As4byteGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2BaseGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2ErrorsGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2PeerGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2PathAttributesGroup
        DESCRIPTION
            "This group is mandatory for all agent implementations."
        GROUP bgpM2PeerConfigurationGroup
        DESCRIPTION
            "This group is optional for implementations that wish to
             support configuration via SNMP."
        GROUP bgpM2PeerAuthConfigurationGroup
        DESCRIPTION
            "This group is optional for implementations that wish to
             support configuration of BGP authentication via SNMP.
             Implementation of this feature requires support of the
             bgpM2PeerConfigurationGroup."
        GROUP bgpM2PeerRouteReflectorCfgGroup
        DESCRIPTION
            "This group is optional for implementations that wish to
             support configuration of route reflection via SNMP.
             Implementation of this feature requires support of the
             bgpM2PeerConfigurationGroup."
        GROUP bgpM2PeerAsConfederationCfgGroup
        DESCRIPTION
            "This group is optional for implementations that wish to
             support configuration of BGP AS Confederations via SNMP.
             Implementation of this feature requires support of the
             bgpM2PeerConfigurationGroup."
        ::= { bgpM2MIBCompliances 1 }


    bgpM2AuthenticationGroup OBJECT-GROUP
        OBJECTS {
            bgpM2SupportedAuthCode,
            bgpM2SupportedAuthValue,
            bgpM2PeerAuthSent,
            bgpM2PeerAuthSentCode,
            bgpM2PeerAuthSentValue,
            bgpM2PeerAuthRcvd,
```

```
            bgpM2PeerAuthRcvdCode,
            bgpM2PeerAuthRcvdValue
        }
        STATUS current
        DESCRIPTION
            "Objects associated with BGP authentication."
        ::= { bgpM2MIBGroups 1 }


    bgpM2CommunitiesGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PathAttrCommIndex,
            bgpM2PathAttrCommValue
        }
        STATUS current
        DESCRIPTION
            "Objects associated with BGP communities."
        ::= { bgpM2MIBGroups 2 }


    bgpM2ExtCommunitiesGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PathAttrExtCommIndex,
            bgpM2PathAttrExtCommValue
        }
        STATUS current
        DESCRIPTION
            "Objects associated with BGP extended communities."
        ::= { bgpM2MIBGroups 3 }


    bgpM2RouteReflectionGroup OBJECT-GROUP
        OBJECTS {
            bgpM2RouteReflector,
            bgpM2ClusterId,
            bgpM2PeerReflectorClient,
            bgpM2PathAttrOriginatorId,
            bgpM2PathAttrClusterIndex,
            bgpM2PathAttrClusterValue
        }
        STATUS current
        DESCRIPTION
            "Objects associated with BGP route reflection."
        ::= { bgpM2MIBGroups 4 }


    bgpM2AsConfederationGroup OBJECT-GROUP
        OBJECTS {
```

```
            bgpM2ConfederationRouter,
            bgpM2ConfederationId,
            bgpM2PeerConfedMember
        }
        STATUS current
        DESCRIPTION
            "Objects associated with BGP confederation membership."
        ::= { bgpM2MIBGroups 5 }


    bgpM2TimersGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PeerFsmEstablishedTime,
            bgpM2PeerInUpdatesElapsedTime,
            bgpM2PeerConnectRetryInterval,
            bgpM2PeerHoldTimeConfigured,
            bgpM2PeerKeepAliveConfigured,
            bgpM2PeerMinASOrigInterval,
            bgpM2PeerMinRouteAdverInterval,
            bgpM2PeerHoldTime,
            bgpM2PeerKeepAlive
        }
        STATUS current
        DESCRIPTION
            "Objects associated with BGP peering timers."
        ::= { bgpM2MIBGroups 6 }


    bgpM2CountersGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PeerInUpdates,
            bgpM2PeerOutUpdates,
            bgpM2PeerInTotalMessages,
            bgpM2PeerOutTotalMessages,
            bgpM2PeerFsmEstablishedTrans,
            bgpM2PrefixCountersAfi,
            bgpM2PrefixCountersSafi,
            bgpM2PrefixInPrefixes,
            bgpM2PrefixInPrefixesAccepted,
            bgpM2PrefixInPrefixesRejected,
            bgpM2PrefixOutPrefixes
        }
        STATUS current
        DESCRIPTION
            "Objects to count discrete events and exchanges on BGP
             sessions."
         ::= { bgpM2MIBGroups 7 }
```

```
    bgpM2CapabilitiesGroup OBJECT-GROUP
        OBJECTS {
            bgpM2CapabilitySupportAvailable,
            bgpM2SupportedCapabilityCode,
            bgpM2SupportedCapability,
            bgpM2PeerCapAnnouncedCode,
            bgpM2PeerCapAnnouncedIndex,
            bgpM2PeerCapAnnouncedValue,
            bgpM2PeerCapReceivedCode,
            bgpM2PeerCapReceivedIndex,
            bgpM2PeerCapReceivedValue
        }
        STATUS current
        DESCRIPTION
            "Objects to report capabilities as received on BGP
             sessions."
        ::= { bgpM2MIBGroups 8 }


    bgpM2AsPathGroup OBJECT-GROUP
        OBJECTS {
            bgpM2AsPathSegmentIndex,
            bgpM2AsPathElementIndex,
            bgpM2AsPathType,
            bgpM2AsPathElementValue
        }
        STATUS current
        DESCRIPTION
            "Objects to report AS paths received on BGP NLRIs."
        ::= { bgpM2MIBGroups 9 }


    bgpM2As4byteGroup OBJECT-GROUP
        OBJECTS {
            bgpM2AsSize,
            bgpM2AsPath4bytePathPresent,
            bgpM2AsPath4byteAggregatorAS,
            bgpM2AsPath4byteCalcLength,
            bgpM2AsPath4byteString,
            bgpM2AsPath4byteIndex
        }
        STATUS current
        DESCRIPTION
            "AS Size objects."
        ::= { bgpM2MIBGroups 10 }


    bgpM2BaseGroup OBJECT-GROUP
```

```
        OBJECTS {
            bgpM2LocalAs,
            bgpM2LocalIdentifier,
            bgpM2VersionIndex,
            bgpM2VersionSupported
        }
        STATUS current
        DESCRIPTION
            "Basic objects in local BGP implementation."
        ::= { bgpM2MIBGroups 11 }


    bgpM2ErrorsGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PeerLastErrorReceived,
            bgpM2PeerLastErrorReceivedData,
            bgpM2PeerLastErrorReceivedTime,
            bgpM2PeerLastErrorReceivedText,
            bgpM2PeerLastErrorSent,
            bgpM2PeerLastErrorSentData,
            bgpM2PeerLastErrorSentTime,
            bgpM2PeerLastErrorSentText
        }
        STATUS current
        DESCRIPTION
            "Errors received on BGP peering sessions."
        ::= { bgpM2MIBGroups 12 }


    bgpM2PeerGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PeerIdentifier,
            bgpM2PeerState,
            bgpM2PeerStatus,
            bgpM2PeerConfiguredVersion,
            bgpM2PeerNegotiatedVersion,
            bgpM2PeerLocalAddrType,
            bgpM2PeerLocalAddr,
            bgpM2PeerLocalPort,
            bgpM2PeerLocalAs,
            bgpM2PeerRemoteAddrType,
            bgpM2PeerRemoteAddr,
            bgpM2PeerRemotePort,
            bgpM2PeerRemoteAs,
            bgpM2PeerIndex
        }
        STATUS current
        DESCRIPTION
```

```
            "Core object types on BGP peering sessions."
        ::= { bgpM2MIBGroups 13 }


    bgpM2PathAttributesGroup OBJECT-GROUP
        OBJECTS {
            bgpM2PathAttrCount,
            bgpM2AsPathCalcLength,
            bgpM2AsPathElementValue,
            bgpM2AsPathIndex,
            bgpM2AsPathString,
            bgpM2AsPathType,
            bgpM2NlriAfi,
            bgpM2NlriBest,
            bgpM2NlriPrefix,
            bgpM2NlriPrefixLen,
            bgpM2NlriSafi,
            bgpM2NlriOpaqueType,
            bgpM2NlriOpaquePointer,
            bgpM2NlriIndex,
            bgpM2NlriCalcLocalPref,
            bgpM2AdjRibsOutIndex,
            bgpM2AdjRibsOutRoute,
            bgpM2PathAttrAggregatorAS,
            bgpM2PathAttrAggregatorAddr,
            bgpM2PathAttrAtomicAggregate,
            bgpM2PathAttrIndex,
            bgpM2PathAttrLocalPref,
            bgpM2PathAttrLocalPrefPresent,
            bgpM2PathAttrMed,
            bgpM2PathAttrMedPresent,
            bgpM2PathAttrNextHop,
            bgpM2PathAttrNextHopAddrType,
            bgpM2PathAttrOrigin,
            bgpM2PathAttrUnknownIndex,
            bgpM2PathAttrUnknownType,
            bgpM2PathAttrUnknownValue
        }
        STATUS current
        DESCRIPTION
            "Attributes received on BGP peering sessions."
        ::= { bgpM2MIBGroups 14 }

    bgpM2PeerConfigurationGroup OBJECT-GROUP
        OBJECTS {
            bgpM2CfgBaseScalarStorageType,
            bgpM2CfgLocalAs,
            bgpM2CfgLocalIdentifier,
```

```
            bgpM2CfgPeerAdminStatus,
            bgpM2CfgPeerNextIndex,
            bgpM2CfgPeerConfiguredVersion,
            bgpM2CfgAllowVersionNegotiation,
            bgpM2CfgPeerLocalAddrType,
            bgpM2CfgPeerLocalAddr,
            bgpM2CfgPeerLocalAs,
            bgpM2CfgPeerRemoteAddrType,
            bgpM2CfgPeerRemoteAddr,
            bgpM2CfgPeerRemotePort,
            bgpM2CfgPeerRemoteAs,
            bgpM2CfgPeerEntryStorageType,
            bgpM2CfgPeerError,
            bgpM2CfgPeerBgpPeerEntry,
            bgpM2CfgPeerRowEntryStatus,
            bgpM2CfgPeerIndex,
            bgpM2CfgPeerStatus,
            bgpM2CfgPeerConnectRetryInterval,
            bgpM2CfgPeerHoldTimeConfigured,
            bgpM2CfgPeerKeepAliveConfigured,
            bgpM2CfgPeerMinASOrigInterval,
            bgpM2CfgPeerMinRouteAdverInter
        }
        STATUS current
        DESCRIPTION
            "Configuration objects for BGP peers."
        ::= { bgpM2MIBGroups 15 }


    bgpM2PeerAuthConfigurationGroup OBJECT-GROUP
        OBJECTS {
            bgpM2CfgPeerAuthEnabled,
            bgpM2CfgPeerAuthCode,
            bgpM2CfgPeerAuthValue
        }
        STATUS current
        DESCRIPTION
            "Configuration objects for BGP peers that support
             authentication."
        ::= { bgpM2MIBGroups 16 }


    bgpM2PeerRouteReflectorCfgGroup OBJECT-GROUP
        OBJECTS {
            bgpM2CfgRouteReflector,
            bgpM2CfgClusterId,
            bgpM2CfgPeerReflectorClient
        }
```

```
        STATUS current
        DESCRIPTION
            "Configuration objects for BGP peers that support route
             reflection."
        ::= { bgpM2MIBGroups 17 }


    bgpM2PeerAsConfederationCfgGroup OBJECT-GROUP
        OBJECTS {
            bgpM2CfgConfederationRouter,
            bgpM2CfgConfederationId,
            bgpM2CfgPeerConfedMember
        }
        STATUS current
        DESCRIPTION
            "Configuration objects for BGP peers that support BGP
             confederations."
        ::= { bgpM2MIBGroups 18 }


    bgpM2MIBNotificationsGroup NOTIFICATION-GROUP
        NOTIFICATIONS {
            bgpM2Established,
            bgpM2BackwardTransition
        }
        STATUS  current
        DESCRIPTION
            "This group contains objects for notifications
             supported by this mib module."
        ::= { bgpM2MIBGroups 19 }


END
```

2. Security Considerations

This MIB module contains controls which relate to core services for interdomain routing using the Border Gateway Protocol. In particular, this MIB allows configuration of operational elements for those services. If such configuration is done without consideration for the effects of such configuration activity, or malicious configuration activity is allowed on the managed elements, the effect could be denial of service to the processes and end users in the affected domain(s).

SNMPv1 is not considered a sufficiently secure environment for the deployment of such configuration ability. Even if the management

data path is secure at the network protocol layer (by the deployment of secure IP, for example), there are still points of exposure around such issues as to what operators and applications are allowed to access and modify the configuration as exposed through this MIB module.

It is strongly recommended that the agent implementor considers the security features afforded by the SNMP Version 3 framework in exposing the configuration features of this MIB module. In particular, the availability and usage of the User-based Security Model [12] and/or the View-based Access Control Model [15] is highly recommended.

It is then incumbent upon the customer deploying network management applications which make use of these configuration features to also consider and deploy a security discipline to make use of these SNMP Version 3 security features. In particular, the operational staff who have access to the configuration controls in their ability to create, set, and delete them, should be carefully considered.

3. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementors or users of this specification can be obtained from the IETF Secretariat.

4. Acknowledgements

Tom Nadeau, Cisco Systems, Inc.
Jon Saperia, JDS Consulting, Inc.
Bill Fenner, AT&T Research
Mike McFaden, Riverstone Networks, Inc.
Joel Krauska, Exodus Networks, Inc.
Carl W. Kalbfleisch, Verio Networks, Inc.
Joe Dupre, Gold Wire Technology

others TBD...

5. Changes From Last Version

This section is used to track changes from version to version of this document. This section will be removed from the document prior to being issued to IDR working group last call.

* Changes from draft-ietf-idr-bgp4-mibv2-01.txt to draft-ietf-idr-bgp4-mibv2-02.txt (28 February 2002)

  Lots of changes in this rewrite, these are the most dramatic:

  Configuration objects and tables added.

  All references to 'bgp' in object descriptors changed to 'bgpM2' to disambiguate from RFC 1657 and its OBSOLETing MIB.

  Community Textual conventions added to beginning of MIB.

  bgpM2CalcLength and PathString columns added to bgpM2PathAttr table.

  Creation of separate bgpM2AdjRibsOutTable.

  Appearance of NLRI table notions such as 'opaque type'.

  Overhaul of specification of AS Path types to accommodate easier management at time of route aggregation.

6. References

[1] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.

[2] Rose, M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.

[3] Rose, M., and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.

[4] Rose, M., "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.

[5] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[6] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[7] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[8] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.

[9] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.

[10] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1906, January 1996.

[11] Case, J., Harrington D., Presuhn R., and B. Wijnen, "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.

[12] Blumenthal, U., and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.

[13] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.

[14] Levi, D., Meyer, P., and B. Stewart, "SNMPv3 Applications", RFC 2573, April 1999.

[15] Wijnen, B., Presuhn, R., and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.

[16] McCloghrie, K. and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based Internets: MIB-II", STD 17, RFC 1213, Hughes LAN Systems, Performance Systems International, March 1991.

[17] Willis, S., Burruss, J., and Chu, J., "Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol

(BGP-4) using SMIv2", RFC 1657, July 1994.

[18] Hares, S., Haas, J., Willis, S., Burruss, J., and Chu, J., "Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4)", draft-ietf-idr-bgp4-mib-06.txt, Work-in-progress.

[19] Rekhter, Y., Li, T., "A Border Gateway Protocol 4 (BGP-4)", RFC 1771, March 1995.

[20] Rekhter, Y., Gross, P., "Application of the Border Gateway Protocol in the Internet", RFC 1772, March 1995.

[21] Traina, P., McPherson, D., and Scudder, J., "Autonomous System Confederations for BGP", RFC 3065, February, 2001.

[22] Chandra, R., Traina, P., and Li, T., "BGP Communities Attribute", RFC 1997, August, 1996.

[23] Bates, T., Rekhter, Y., Chandra, R., and Katz, D., "Multiprotocol Extensions for BGP-4", June, 2000.

[24] Bates, T., Chandra, R., and Chen, E., "BGP Route Reflection - An Alternative to Full Mesh IBGP", RFC 2796, April 2000.

[25] Sangli, S., Tappan, D., and Rekhter, Y., "BGP Extended Communities Attribute", Work-in-progress.

[26] Rehkter, Y., and Rosen, E., "Carrying Label Information in BGP-4", RFC 3107, May 2001.

7. Authors' Addresses

Jeff Haas
NextHop Technologies
825 Victors Way, Suite 100
Ann Arbor, MI 48108
Phone: +1 734 222-1600
Fax: +1 734 222-1602
Email: jhaas@nexthop.com

Susan Hares
NextHop Technologies
825 Victors Way, Suite 100
Ann Arbor, MI 48108
Phone: +1 734 222-1600
Fax: +1 734 222-1602
Email: skh@nexthop.com

Wayne Tackabury
Gold Wire Technology
411 Waverley Oaks Rd.
Waltham, MA 02452-8401
Phone: +1 781 398-8819
Fax: +1 781 398-8811
Email: wayne@goldwiretech.com

8. Full Copyright Statement

Table of Contents